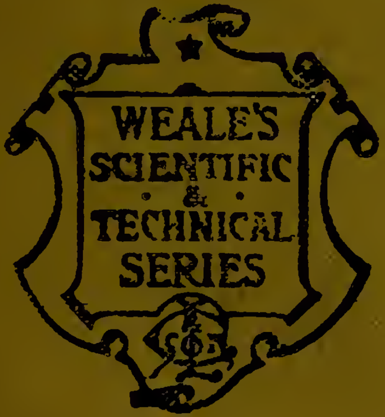
LAUNDRY MANAGEMENT



A HANDBOOK

FOR USE IN

PRIVATE AND PUBLIC LAUNDRIES

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LAUNDRY MANAGEMENT

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LAUNDRY MANAGEMENT

A Handbook for
Use in Private and Public Laundries

INCLUDING

*DESCRIPTIVE ACCOUNTS OF MODERN
MACHINERY AND APPLIANCES
FOR LAUNDRY WORK*

WITH NUMEROUS ILLUSTRATIONS

Fourth Edition

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PREFACE.

In the course of the Author's duties as Editor of a technical journal, the want of a complete and practical handbook on Laundry Management has been repeatedly brought to his notice. To supply this undoubted void in the list of technical and trade publications has been the one object held in view in writing this book.

The work is divided into two Parts, the first of which deals with the operations and processes usually carried on in the best English laundries. This portion of the work will be found especially useful to those about to commence business as laundrymen, and will also show many who are already in the trade, as well as those housewives who desire the highest results, how to set about the business of washing and dressing linen in the best and most economical way. The hints and suggestions which will be found in the several chapters have all been tried in actual practice, and should, therefore, prove of great value. The chapters on Water and Disinfection have been written with special care.

The Second Part deals with the planning and installation of laundries, and the machinery to be used therein. These chapters, the Author has no hesitation in affirming, may be taken as safe guides both by the private laundress and the trader. Notes are given on manual, automatic, and steam-driven machinery, the characteristic features of prominent types only being dealt with. While treating of technical and mechanical details, it has never been forgotten that the book is principally intended for a public whose want of knowledge of technical terms necessitates special treatment.

The book will be found to cover the whole field of the laundryman's usual work; and it may be put with advantage into the hands of all young people who intend to make their way in the trade.

LONDON,
June, 1889.

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INTRODUCTION.

Few industries have had their methods and processes more thoroughly revolutionised within the last two or three decades than the laundry trade. The unsatisfactory state of the old cottage laundries—where linen of all kinds and from any quarter was heaped together, and treated in the roughest possible manner to a process of beating and scrubbing out impurities—has given way to careful sorting of linen to guard against the possibility of contamination and infection, and to efficient but harmless cleansing on true scientific principles, whereby soiled linen is made pure without damaging it.

This change is mostly due to the introduction of machinery. Where large quantities of soiled linen had to be treated rapidly the old hand-scrubbing could not be carried out. The use of bleaching fluids and hard scrubbing brushes followed, to the destruction of property. With machinery, however, we can treat large quantities at once, and even then shorten the time, reduce the labour, and ensure better equalisation of results. This was the case even with the earlier hand-worked machinery; but now that steam has been utilized, both as motive power and a cleansing medium, the beneficial change is complete.

With the widely different ideas shown in the construction of laundry machinery we deal at length in several chapters, so we need not stop to discuss the matter now. It is sufficient to say that there are all kinds of machines suitable for any class of laundry, no matter on how large or how small a scale the work is to be done.

The one great requirement for the successful management of a laundry is, ORDER.

The very first duty of the laundry manageress, or the person in charge of the humblest establishment, is to draw up a code of rules, which should be strictly enforced, and observed by the manageress and forewoman, as well as by the ordinary workpeople. Of course such rules will have to vary with the extent of the establishment and *personnel*, and the class of work done. They should be as simple and clear as possible, that no one may have an excuse for transgression.

"A place for everything, and everything in its place," is a good rule, which applies to persons as well as things. Everyone should have his own special and well-defined duties. It is wonderful how much more work is done, and that smoothly and without friction, by rigidly adhering to this plan. When everybody knows that a certain duty has to be performed, and that he or she will be held responsible for any deficiency, there is no room left for the more or less sincere excuse that it was thought someone else was going to do it.

The sanitary arrangements of the laundry and the condition of the workpeople must also be attended to; care and cleanliness being necessary in every department.

Supervision of the laundry must be thorough and intelligent, in order to make it pay. A private laundry pays by saving in expenditure; a trading laundry pays when the income exceeds the expenditure, leaving a fair rate of interest for the capital invested, and a surplus as remuneration for the time and skill of the proprietor. In either case the desired end can only be attained by watchful care over every item of incoming and outgoing. We would strongly urge upon our readers the necessity of attending to bookkeeping. This is more especially indispensable for the trading laundryman. Besides the entry washing books, with the names of customers, their marks, and their weekly lists, a ledger and a cash-book should be kept. It would be all the better if a complete system of commercial bookkeeping were adopted; but with the above books intelligent people will be able to manage, and at any time to see how they stand financially, what kind of work pays, and so on. As a rule trading at fair but moderate prices is the best policy.

It is pleasing to be able to recognise the fact that in commercial laundries the workpeople as a class are greatly improving. The superior methods of carrying on the work demand a higher grade of intelligence, and the laundry trade is fast taking a high place among our national industries. The average manager, manageress, or forewoman of to-day is more intelligent, better educated, and more profitably remunerated than was the case even ten years ago. A practical laundry manager and proprietor pointed out some time back, in *Work and Leisure*, that in some departments of the laundry ladies might often find employment, to their own advantage and the general benefit of the working girls; and the editorial comments then published are worthy of reproduction :—

"That gentlewomen should qualify themselves for the superintendence of all branches of female industry, and among others for that of laundry work, has often been advocated in these pages. At the same time our readers have been constantly reminded that efficient superintendence can only be carried out by persons who are themselves practical experts in the mechanical part of the work, and at the same time acquainted with the theory or scientific principles involved in its successful performance. Our suggestions have not been in vain, and within the last five or six years several ladies have become proficients in 'getting up fine linen,' and in the sister arts of 'putting a glaze on shirt-fronts,' goffering lace, etc. Many of these have entered upon posts of usefulness and dignity, and are earning by no means despicable remuneration in connection with large private or public laundries or institutions."

It is certainly most necessary that forewomen, bookkeepers, and manageresses should be mistresses of the whole laundry business. But educated women would find the task of getting up the requisite technical knowledge far easier than they might at first suppose; and for those who have enjoyed early household training the preliminary stages of apprenticeship may be considerably shortened. We would, however, advocate a thorough technical education for all those qualifying themselves for work in steam laundries. The industry is now being put on such a footing that there is a demand for intelligent and educated women. The improvement made in laundry workers is already noticeable, and we are happy to believe that the members of the trade are rising to the increasing demands made upon them by the general progressive movement.

LAUNDRY MANAGEMENT.

PART I.

OPERATIONS AND PROCESSES.

CHAPTER I.

SORTING AND MARKING LINEN.

Receiving Linen—Marking—Inks—Cotton-marking: three systems; 1, the Numerical system; 2, the Alphabetical system; 3, the Geometrical system—Sorting—Separate Room—Bins—Primary Rules.

The Receiving of Linen.—In order to conduct laundry work without friction and with success, whether on a large or small scale, for private or for trade purposes, order and regularity are absolutely necessary. Without order and regularity time will be inevitably wasted, and probably much property damaged and lost.

Linen on being brought to the laundry should at once be counted, and if accompanied with a list, carefully tallied with it, and any inaccuracy immediately noted. The linen is then sorted into parcels according to their kind; marked, and duly entered in a day washing book specially kept for the purpose. When carrying on operations on a large scale, the sorting of linen becomes an absolutely necessary task, as the parcels are washed separately; this method will save trouble if adopted even in the smallest wash-house. And, of course, it is as well to make the separate parcels while counting the linen, and thus save a double operation.

Marking.—For trade purposes marking with ink is now almost entirely abandoned, as the majority of customers strongly object to having their linen more or less seriously and permanently disfigured with black marks, whether made by pen or India-rubber stamp. And in this matter the public is undoubtedly right, for when people are in the habit of travelling about, or for some reason or other have to make a change in their usual washerwoman, the mark has also to be changed or modified, thus producing an unsightly blemish. Blue or red, or blue and red, cotton is now used in the majority of laundries.

Collars and cuffs, however, are still, as a rule, marked with marking ink.

Inks.—As ink in certain instances, both for the family or the public, is often found easy and economical for marking purposes, it is well to warn readers against cheap productions by unknown makers. Much of this cheap stuff is very inferior, and when it merely fades after one or two washes, the housewife may think herself lucky, for not a few marking inks are manufactured with such powerful corrosives that the linen is completely ruined when placed in warm water after being marked. When choosing a marking ink, buy of a first-class firm, or wisely experiment upon old garments before using it on a large scale. There are means of taking out marking ink, but these are always necessarily destructive.

Three Systems of Marking.—The process of marking with cotton is a somewhat tiresome and expensive one, but it cannot be dispensed with. There are three principal methods of marking: the numerical, alphabetical, and geometrical, as shown in the following list. Some laundries have specially-designed systems of their own, but this is not necessary.

Numerical System.

1, 2, 3, 4, 5, 6, 7, 8, 9; 101; $\frac{102}{1}$; $\frac{102}{A}$.

Alphabetical System.

AA, AB, &c.; BA, BB, &c.; Aa, Bb; aa, bb; $\frac{CD}{A}$; $\frac{CD}{b}$.

Geometrical System.

$\bigcirc$, $\square$, $\triangle$, $\diamond$, $+$, ⚓; $\frac{+}{+}$, $\frac{+}{\text{⚓}}$, $\frac{+}{\triangle}$, $\frac{\text{⚓}}{\diamond}$.

The Numerical System, as will be seen, simply consists in numbering all the linen of one customer with a special figure, or a combination of figures. Thus Mrs. Smith is represented by 101, Miss Brown by 102, and so on. In large establishments the district in which the customer resides is sometimes shown thus: Mrs. Smith, $\frac{101}{1}$; Miss Brown, $\frac{102}{3}$; which means that the one customer lives in a certain neighbourhood, let us say Highgate, and the other at Hendon.

The Alphabetical System consists in combining letters, thus: AA, AB, BA, BB, and so on right through the whole alphabet. This is an exceedingly easy and useful method indeed, and one which gives us 676 combinations; this may be doubled or trebled with ease, merely by combining capitals with small letters, then using two small letters. In this system the districts may be represented as before, or with letters instead, thus: $\frac{AA}{1}$ or $\frac{AA}{a}$.

The Geometrical System consists in a number of simple conventional symbols: squares, circles, diamonds, triangles, crosses, anchors, etc. These symbols may be used in various combinations, above and below a straight line, with letters or numerals.

For the actual work of marking, the numerical and geometrical systems are the easiest, but the most simple for recognition and general working are the alphabetical and geometrical, while the last seems to be specially appreciated by those working on a large scale. These marks once assigned to a regular customer should be adhered to, thus saving future work. These special symbols are entered in the day-book against the customer's name. Occasional customers had also better be assigned a special mark to save trouble; but chance customers' marks can, of course, be used when once their linen has been delivered. Much unnecessary trouble and expense is entailed in many laundries owing to intricacy of marking systems. It is best to adopt one coloured cotton; and not attempt a combination, red for the name and blue for the district, as is done by some.

Sorting.—The sorting and marking room should be kept as free from noise and confusion as possible. The person who counts the linen and compares it with the list, passes it on to the marker, who deftly, in as few stitches as possible, legibly marks each item, and when once done with, throws it into separate bundles or receiving bins.

The sorting of linen is, as we have said, a necessary preliminary to washing. Usually lace, nets, fine muslins, should form one batch; collars and cuffs a second; white body linen a third; coloured articles a fourth; table linen a fifth; bed linen a sixth; and coarse household linen a seventh. Silk and flannel goods are, of course, to be separated to undergo special treatment.

This sorting may take place in the wash-house, but is better carried out in a separate room. The linen may be done up in bundles, but in large establishments the various classes of goods are sorted into wicker-work or wooden bins on wheels, forming little trolleys, which are very convenient to move from one room to another, so saving labour and time.

The five cardinal rules for the proper and economical management of this initiatory and important part of all large laundries are :—

1st. Silence and close attention to business.

2nd. A definite and unvarying routine.

3rd. Ability to count correctly and with rapidity.

4th. Legibility in marking.

5th. A place for everything and everything in its place.

If these rules are rigidly adhered to alike by manageress or matron and her girls, the work will become comparatively easy.

A few hints as to the best method of taking out marking ink from linen will be found in Chapter IV.

CHAPTER II.

DISINFECTING.

General Remarks—The Chemical Features of True Disinfectants—Hydrochloric Acid—Soaps—Carbolic Acid—Condy's Fluid—Sanitas—Borax—Hydroleine—Methods of Disinfecting—The Chemical Bath—Fumigation—Hot Air—Dr. Parsons's Remarks—Steam—Washington Lyon's Patent Steam Disinfector—Downton-Mitchell Patent Automatic Ventilating Desiccator—Preservation of Chemical Disinfectants.

General Remarks.—In all well-ordered laundries, whether public or private, the disinfection of linen is an important part of the ordinary business routine. In many laundries all the linen which is sent to the establishment undergoes careful disinfection before being allowed to enter the wash-house. Where a great deal of work is done for all kinds of people this precaution is a judicious one, and the little extra trouble and expense well repays the professional laundryman. We find in practice a great number of different methods of disinfecting. Chemical baths, fumigation, exposure to hot-air or steam, and the use of prepared soaking fluids or chemically manufactured soaps, prevail according to the necessities of the case and opinions of the managers.

The Chemical Characteristics of True Disinfectants.—It is necessary to say a few words on the nature of disinfectants. In these days of sanitation and hygiene we hear a good deal about disinfectants, but the popular ignorance as to what really does constitute a disinfectant is astounding. A true disinfectant is a preparation which induces certain well marked chemical actions by which organic matter is either modified or destroyed. Many of the so-called chemical disinfectants are merely more or less effectual deodorisers. Now the destruction of evil-smelling gases or particles is a point of comparatively little importance to us, for it is easy enough to destroy or mask a smell and yet leave the infectious matters practically untouched. What is required is to set up a true chemical action, by oxidation or otherwise, whereby the morbid matter is rendered harmless. This chemical action must be rapid and sure, but yet of such a kind that the vegetable fibres or animal hairs of various fabrics are not destroyed when operated upon. Strong alkalies are extremely bad for all woollens, as they act destructively on the texture of the fibres, depriving them of their elastic and other qualities.

Quicklime and hydrochloric acid are again good specimens of rapid disinfectants, but their action is too radical and destructive to be employed in the laundry.

Soaps.—Soap may be looked upon as a mild form of disinfectant. We now have a vast number of disinfecting soaps, which are saponified fats or oils in which certain chemicals have been incorporated. Carbolic acid is one of the most common ingredients of this class of soaps.

Carbolic Acid.—That marvellous preparation of coal-tar liquor, carbolic acid, is a very powerful disinfectant, and is deservedly held high in popular estimation. But it is a poison, and, if not most carefully used, very destructive, besides having other serious drawbacks for ordinary use. Probably the safest form in which to employ carbolic acid for the disinfection of clothes and linen is to make use of carbolised soap, but this is an expensive form.

Condy's Fluid.—This preparation is an excellent disinfectant which formerly was largely employed in laundry and other similar work, but its colour, price, &c., are decidedly against it; and although a perfect disinfectant, we now possess many compounds which are more easily handled, and therefore better answer our purpose.

Sanitas.—The resinous exudations of various conifera and eucalyptus trees exhibit remarkable oxidising powers. The properties of these substances have been utilised in preparing a very valuable group of disinfectants, now known to the scientific world and to commerce by the name of sanitas. Crude sanitas acts both rapidly and surely as a germicide and a destroyer of infectious spores. It is easily handled in all its varied forms, mixing thoroughly well with cold and hot water and washing liquors. It is non-poisonous, colourless, possesses a pleasant odour, and does not stain either the hands or fabrics. Sanitas, like carbolic acid, is easily combined with soaps, soft soaps, and washing powders, so that it can be used in the laundry for a chemical bath of varying strength, or, in the shape of soaps, in the soaking tubs and washing machines.

Borax.—It has long been known to scientists that borax possesses a distinct preservative quality, arresting decay in organic tissues, and yet acting as a powerful detergent. As a cleansing agent borax gained a deserved popularity many ages ago. This beautiful salt is prepared either from crude saline deposits found in many parts of the world, extracted from the mud of alkaline lakes in Asia and America, or crystallized from the boracic acid fumes and watery vapours bursting through the earth's crust in volcanic regions. Chemical analysis and practical experiments have revealed that the disinfective qualities of borax are due to the highly interesting element *boron*. This elemental substance is found in varying quantities in boracic salts, those obtained from California being by far the richest in pure boron. Prepared Californian borax may be advantageously employed instead of soda, for it not only acts as a water softener and a powerful detergent, but also and at the same time as an effective disinfectant. It, moreover, has no destructive effect either on wools or linens, thus differing considerably from all forms of soda salts. Boron acts powerfully and immediately on all forms of low life; it seems to arrest permanently all vital forces, and thus attacks infectious germs and spores in the most effectual manner.

Hydroleine.—Hydroleine is another mild disinfectant which may be safely used in laundries. It is a patented article sold as a powder or in consolidated gritty blocks. This whity-greyish substance is mixed with boiling water into a thick cream and allowed to cool into a jelly or soft soap, when it may be diluted in warm or cold water. It is designed as a soap substitute for use in the soaking tubs, hand-washing troughs, and machines. All the processes of washing can be gone through with hydroleine alone, and the substance while acting as a detergent has also a disinfective action. Hydroleine is also prepared with carbolic acid in order to increase this latter quality. It has no harmful effect on the tissues of linen or wool. As a proof of this it may be mentioned that hydroleine is used to cleanse virgin wool of its excess of natural grease.

Methods of Disinfecting.—Having given the foregoing brief details of the various disinfectants most in use, we will now deal with the ways adopted for actually disinfecting linen and wearing apparel.

The Chemical Bath.—Many laundries have a small chamber in which are placed two or more galvanized-iron tanks. The walls and ceiling of each chamber are generally provided with wooden suspenders on which the disinfected linen is hung to drip before being removed to a rinsing trough or the soaking tubs. There are usually two baths, a weak one and a more powerful one, the fluids differing in kind or degree. Water is run into the tanks and carbolic acid, sanitas, or any other disinfecting fluid or powder dissolved in it. All linen (in some establishments) is passed through the weak chemical bath, the strong bath being reserved for *stained* linen, or linen known to have come from an infected quarter. The great thing is not to make the chemical bath too strong, more especially if carbolic acid or hydrochloric acid is being used. In most cases it will be found necessary to rinse the linen in tepid water a few minutes after its removal from the bath. The tanks used for these chemical baths should be of strong make and well riveted; the metal should be of such a quality as to make rusting an impossibility.

Fumigation.—Disinfection of linen in air-tight tanks, or ovens, by means of fumes derived from the destructive combustion of various chemical substances, is a far too dangerous process to find favour with practical laundrymen. In some of the larger establishments on the Continent this method has been adopted, more especially in laundries attached to public and charitable institutions, but the results, so far as the preservation of linen is concerned, do not warrant the spread of this effective (but otherwise obnoxious) method of disinfection.

Hot Air.—The uncertainty, and in many cases the difficulty, of using chemical disinfectants for the destruction of germs and infectious spores induced many scientific men to pay close attention to the subject, with the ultimate result of an almost unanimous recommendation of the adoption of hot air, or steam, as efficacious and safe mediums. Dr. Parsons, in the year 1884-85, drew up an elaborate report reviewing the whole question for the Local Government Board. Referring to Professor Koch's Berlin experiments, Dr. Parsons says:—

"The general result of the experiments with chemical agents was to show the comparative or entire inertness as germicides of most of the substances commonly received as disinfectants, as carbolic and sulphurous acids, chloride of zinc, &c

"In hot air the temperature penetrates so slowly into articles to be disinfected that after three or four hours' heating to 284° F. articles of moderate dimensions, *e.g.*, small bundles of clothes, pillows, etc., are not disinfected. By the heating for three hours to 284° F., necessary for the disinfection of such objects, most materials are more or less injured."

Dry heat, or hot air, is applied to infected clothes, bedding, linen, &c., in an air-tight chamber, to which the heated atmosphere is conveyed from a furnace by means of flues. The *desiderata* for a good hot-air disinfecting chamber are:—(*a*) Uniform distribution of heat; (*b*) the maintenance of heat at a uniform degree; (*c*) an accurate indicator of the interior heat, by which the temperature may be ascertained and regulated accordingly. For economical purposes, the heat ought to be able to be generated rapidly and at little expense. Furnaces and disinfecting chambers are generally of simple construction, and are easily installed. But there are several methods of applying the dry heat. The chamber may be closed, when once the linen is placed inside, and the heat applied from the outside. In other instances the hot air is actually introduced into the chamber by flues directly from a furnace. Other chambers are jacketed, that is, are provided with an outer and inner casing; hot air, hot water, or steam, being introduced between the casings, and so heating the interior. Chambers may be heated by means of hot-air or steam pipes; or (the most primitive form) by direct application of fire, like in old-fashioned brick ovens.

Steam.—Linen may be disinfected by a current of free steam introduced into a closed tank, provided with a high-pressure safety valve; or by steam forced at high pressure into a closed chamber. Dr. Parsons, comparing the relative merits of disinfecting by hot air and steam, says:—

"The results obtained with steam were strikingly superior to those with dry heat. Moreover, the penetration of the heat into articles exposed to steam took place far more quickly than into the same articles when exposed to dry heat.

"It may be assumed that the contagia of the ordinary infectious diseases of mankind are not likely to withstand an exposure of an hour to dry heat of 220° F., or one of five minutes to boiling water or steam.

"Dry heat penetrates very slowly into bulky and badly-conducting articles, as of bedding or clothing; the time commonly allowed for the disinfection of such articles being insufficient to allow an adequate degree of heat to penetrate into the interior.

"Steam penetrates far more rapidly than dry heat, and its penetration may be aided by employing it under pressure.

"In hot air the penetration of heat is aided by the admixture of steam, so as to moisten the air, but hot moist air did not appear to have a greater destructive effect upon spores of anthrax bacilli than dry heat.

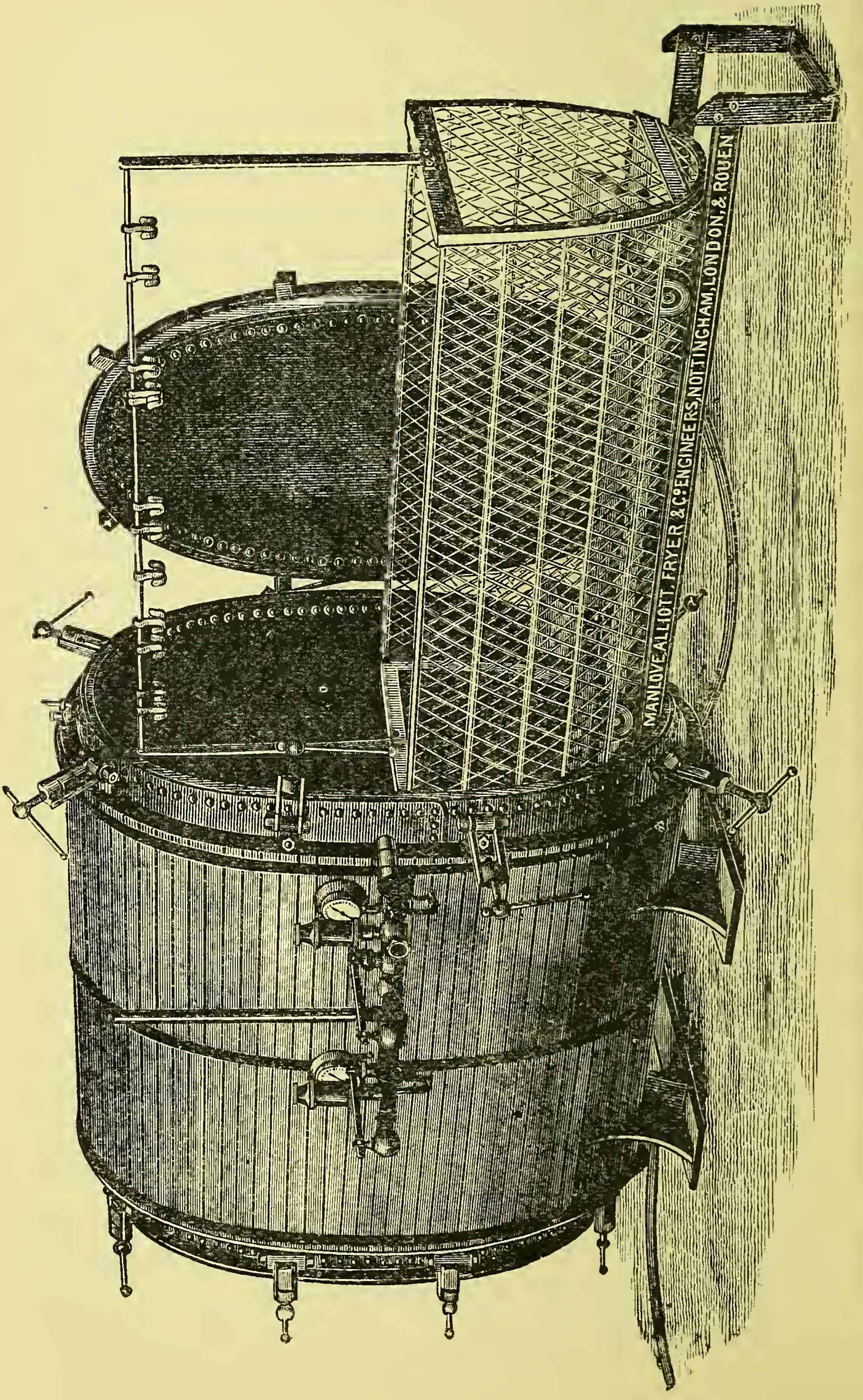
"Scorching is especially apt to occur where the heat is in the radiant form.

"The wetting effect of steam may be diminished by surrounding the chamber with a jacket containing steam at a higher pressure, so as to superheat the steam in the chamber."

There are, of course, various ways of applying steam as a disinfectant. We have already shown that linen may be placed in a tank or other closed vessel having a safety valve, and the steam introduced continuously at high pressure, thus causing an endless flow of steam. Another simple method is to fill a closed vessel with steam, and let the clothes remain in it for thirty-five or forty minutes. Both these methods may be practised at little expense, and with very simple apparatus. For large establishments more complicated apparatus is required, and will prove more economical in the end.

Washington Lyon's Patent Steam Disinfector.—This apparatus (shown in Fig. 1) consists of a steam-tight barrel, both the ends opening on strong hinges. Inside there is a movable half-section (horizontally) galvanised iron cage, for the reception of the linen or clothes or other fabrics. The outer casing is provided with steam supply pipes and cocks, safety valve, and indicating gauge. As a rule the steam disinfector is placed in an outside house, partitioned off in the middle, and having two doors, as in Fig. 2. By these arrangements the disinfector can be so fixed as to have the ingress and egress opening into different apartments, both of them apart from the laundry; thus keeping the supposed infected and disinfected linen quite separate. When in use, the ingress end of the disinfector is opened and the linen placed in the cage, which is pushed in, and the door closed by means of a powerful screw-fitting. This done, the steam cock is turned on until the proper temperature is reached. The condensed water is drained off. By means of the cock and safety valve the heat can always be accurately regulated according to the necessities of each case. The work of this machine may be depended upon. It may be well to mention that the proprietors of this patent manufacture a portable steam disinfector on wheels.

Downton-Mitchell Patent Automatic Ventilating Desiccator.—Two Sydney gentlemen have patented an ingenious system for drying prints, textile fabrics, and other materials. The machines built on this system also act as capital disinfectors, while they may be used as clothes-drying chambers. Briefly stated the process consists in (*a*) the combination of parts, comprising a novel purifying apparatus in which the air is made dry; (*b*) a special construction of a distributing chamber; and (*c*) the combination and arrangement with an air intake and a distributing chamber, of a steam ejector or injector for effecting a continuous circulation of the


MANLOVE, ALLIOTT, FRYER & Co. ENGINEERS, NOTTINGHAM, LONDON, & ROUEN

drying or disinfecting medium (hot air or medicated fumes). The air-tight chamber may be fitted up in any shape according to the requirements of each particular case. It is provided with a double flooring, the upper one being perforated to allow of the equal distribution of the heated air, steam, or medi-

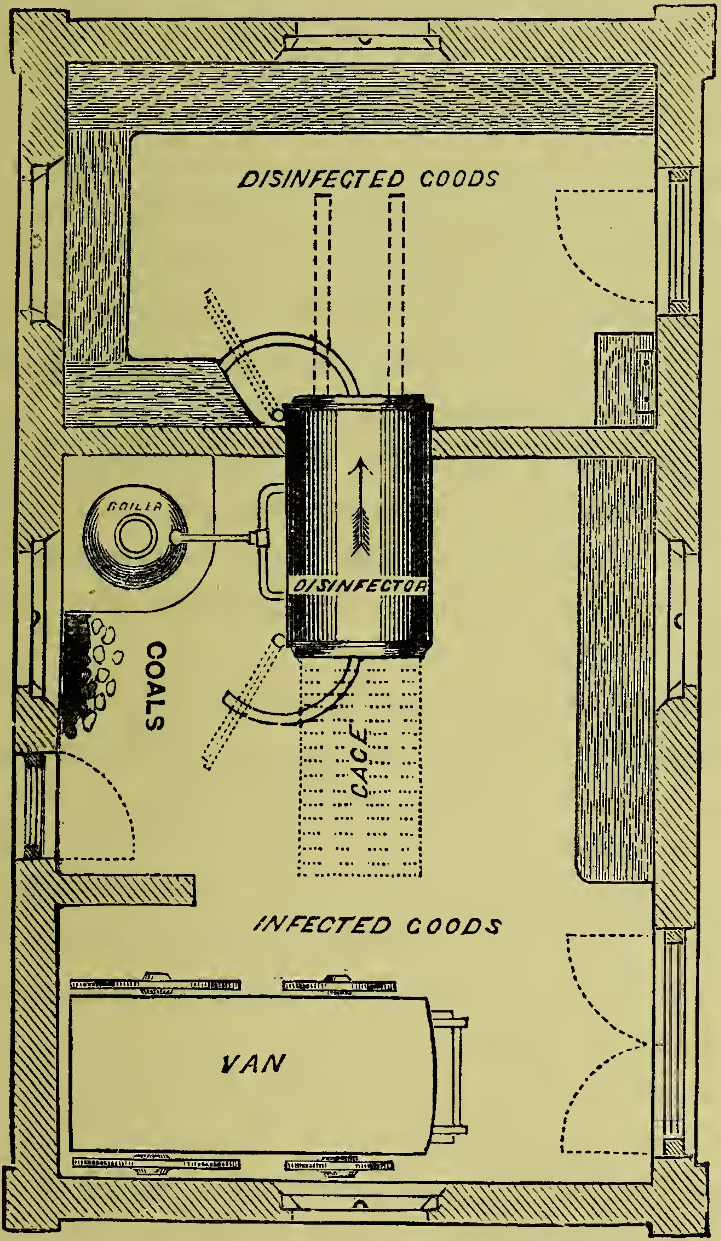


FIG. 2.—STEAM DISINFECTOR. GROUND PLAN OF DISINFECTING HOUSE.

cated fumes. The steam and water are withdrawn by the ejector, and may be conveyed to the boiler. The chamber may be built of galvanized iron or brick, and is usually erected over the boiler. It is fitted with hanging horses for drying clothes, or a number of trays. The heated air and the steam or fumes are introduced through pipes at the bottom of the chamber; the stream of fresh air, mentioned as feature (*a*) in the specification, is drawn in by means of a bell-mouthed strainer, and passed over trays of felt saturated with some chemical having a strong affinity for hydrogen, etc., to deprive the air of all moisture. The action of drying is twofold, and as a disinfector the system leaves nothing to be desired.

Preservation of Chemical Disinfectants.—As a parting hint, we may say that as most disinfectants, solid or fluid, act by means of oxidation, they should invariably be kept secluded from air, or their remedial virtues will rapidly and materially diminish.

The disadvantage of using chemical baths is that such a plan is hardly applicable to coloured goods, the dyes generally suffering in loss of colour, or being made to *run* when in contact with chemicals. Steam will also cause unstable dyes to run into each other. In such cases carbolised soap, sanitas, etc., can be used in the washing machine; or, in bad cases, place the linen in a dry chamber, heated by outside application of hot fumes or steam.

The fluids used in chemical baths should not be employed too long, or be used twice over for different articles or goods.

Poisonous Disinfectants.—Carbolic and hydrochloric acids and suchlike disinfectants should always be kept in coloured bottles marked "Poison," a precaution which is not necessary with sanitas and other non-poisonous fluids or salts.

CHAPTER III.

WATER AND WATER SOFTENING.

Hard Water—Degrees of Hardness—London Water—Easy Tests—Water Softeners—The Clark Process of Softening Water—The Use of Lime—The Porter-Clark Process—Phosphate of Soda Process.

The purity of water is a very necessary matter where laundry work has to be carried on economically and on an extensive scale. Water which holds in suspension or solution earthy and organic matter will, if used for washing, discolour the linen and make thorough cleaning an impossibility. The presence of iron in water used for laundry purposes is extremely bad, for not only will the mineral be deposited in the boilers and machines, but it will form a thin coating on the fibres of the linen washed, thus spoiling the colour and permanently damaging the fabric. But practically the great question of water for laundry workers resolves itself into this: Is the water soft or hard?

Hard Water.—Water, whether derived from a river or a well, is termed "hard" when it holds in suspension or in solution certain earthy salts. If we take a glass full of troubled water from a running stream and allow it to stand, after a more or less prolonged interval the water becomes clear (or at least practically clear to the unaided eye), and we find a thick deposit of dirty mud or greyish chalk at the bottom. If we had at first passed this water through a common filter, the water would have come out as clear and to all appearance free from earthy matters. As a rule, however, some very simple tests will speedily demonstrate beyond possibility of doubt that the natural depositing, or the more thorough filtration, has merely got rid of a part of the impurities. Lime, in one form or another, is still present.

Sometimes this quantity of lime (so intimately united with the water as to be invisible to the eyesight) is yet very great and extremely difficult to get rid of. In such cases we have to deal with a *permanently hard water*. Only part of this *permanent hardness* is got rid of by boiling, though the deposit of chalk which takes place on the bottom and sides of the vessel in which it is being boiled may be considerable. Now, to form an idea of the damage such waters will cause to clothes, it is only necessary to boil a clean piece of brushwood in the cauldron or kettle. On inspection it will be seen that the brushwood is coated all over with a kind of fur or a hard greyish layer. This is chalk, perhaps mixed with silica or iron; and if linen be boiled in such hard waters an exactly similar deposit takes place on the tissues, often coating every fibre, and, of course, damaging the fabric, besides preventing its being properly cleansed. When soap is present with the clothes in these boiling waters, the deposit of lime is greater and of a far more troublesome kind.

Degrees of Hardness.—The degree of hardness of water simply means that the water contains more or less lime or silica—or, looking at the question from a laundryman's point of view, that a measured quantity of water requires a given quantity of alkaline soap to neutralise the bi-carbonate (or other form) of lime held in solution. Thus, from the laundryman's point of view, the degree of hardness in water practically means its capacity for destroying good soap. We will explain this. When soap is dissolved in warm hard water, it immediately unites with the lime, and a precipitate of insoluble *lime* *soap* is formed. Thus the quantity of a soap of a known composition destroyed determines the degree of hardness. Now it is sufficiently evident that if this lime is not driven out of the water before being used for laundry purposes, this chemical action, which neutralises the soap and resulting in a depositing of lime, will go on to the material loss of the laundryman. The lime must be got rid of, and as cheaply as possible.

Manufacturers of commercial soaps occasionally offer the public a highly alkaline soap, alleging that it will wash clothes and soften water at the same time. But alkali (soda) is much cheaper than properly saponified fats (pure soaps), and, therefore, if required, may be used separately. Then, again, a highly alkaline soap is injurious to animal and vegetable fibres. Moreover, the deposit of insoluble lime soap necessarily caused in its highest degree by such soaps as here discussed, tells against the durability and appearance of the clothes being washed.

London Water.—It is currently estimated that from 150 to 200 grains of first-class laundry soap will be required to render every gallon of London water tolerably soft. This is the average; in some districts it is less, but in others much more. So that the man or woman who constantly uses hard water for washing purposes, annually throws away many pounds of good soap, while the work is never quite satisfactory, the labour is excessive, and the wear and tear of clothes and machinery far more than it should, or than it need, be.

Easy Tests.—For ordinary purposes a rough estimate of the qualities of any given water will be sufficient. To determine the strength and power of our great enemy—*hardness*—melt a little pure soap in alcohol. A few drops of this solution should be poured in a glass full of the water to be tested. If the water becomes milky, lime is present, and consequently the water is hard. A practical American authority in these matters thus sums up the ready tests for laundrymen:—"To test if water contains any copper, add to it some soft iron filings, and after a few minutes add a few drops of ammonia. A blue colouration will indicate the presence of copper. For carbonic acid, mix some of the water with the same volume of lime water. If carbonic acid is present the liquor will become milky at once. The milkiness disappears if muriatic acid is added. To test for sulphur, place the water in a bottle with a little mercury, and close the bottle for a few hours; if the mercury takes darkish appearance and divides, on shaking, into a silver grey powder, it is proof that sulphur compounds are present.

"Pure lime is detected by adding to the water one or two crystals of oxalic acid; if lime is present a milky precipitate will form. Sulphate of lime, shows a white precipitate on the addition of barium chloride to the water, this precipitate being insoluble in nitric acid. Alkalies and alkaline earths are detected by means of litmus paper. Red litmus paper turns blue if alkalies are present. For iron add to the water a few drops of a decoction of galls. If iron is present the water will take an inky appearance. Iron can also be detected by the addition of a few drops of a solution of yellow prussiate, a blue colouration indicating the presence of iron. To test for magnesia, heat the water to a boiling point and then add a little carbonate of ammonia and a little phosphate of soda. If magnesia is present it will precipitate. For acid, dip blue litmus paper in the water; if it changes to red acids are present; if the acid is carbonic acid a white precipitate will form on the addition of lime water."

Water Softeners.—There are several natural and artificial, or manufactured, water softeners; some of which may be safely used by laundrymen. Caustic soda softens water; but it is rather an expensive substance for this work. Borax is also a powerful water softener, and will at the same time act as a detergent, though we prefer to look upon the softening and cleansing operations as separate ones, and keep them apart. About a couple of tablespoonfuls of prepared borax will soften a pail of water of average hardness (say 15 degrees). Hydroleine (a patented soap-substitute) is also used as a water softener, but as this preparation is not much cheaper than soap, no great saving is effected by its employment for this purpose. Soda and borax will be found sufficient where washing is carried on on a small scale, and the water used is not too hard. The salts should be dissolved in the water a few minutes before the soap or linen is put in, and when possible the water should be drawn out of the tub or tank in which it has been, leaving the deposit behind.

The Clark Process of Softening Water.—When laundry work has to be done on a large scale with hard water, some more elaborate but economical plan of water softening will be found necessary than any of those we have as yet described. The Clark process, briefly stated, consists of adding lime to the water, which combines with the excess of carbonic acid present, and is at once precipitated, carrying with it the whole or greater part of the lime and other earthy salts held in solution. This process has been often modified, and various elaborate systems of filtration and mechanical mixing devised for securing thorough results. But for our purposes the Clark process pure and simple will be found sufficient, and can easily be carried out.

Let the laundryman proceed in this way: Run a sufficient quantity of water for the next twenty-four hours into a tank early in the forenoon. If the space at disposal will allow of a larger tank it will save time to prepare two or three days' supply at one time. Mix in a pail the proper quantity of slaked lime (determined by the quantity of water and the degree of hardness), stirring it well. Add this to the water in the tank and stir up together: by the next morning the water will be ready for use. It should be drawn off through a pipe placed a few inches above the bottom of the tank, which should be flushed out after each proceeding.

In order to shorten the process and make it more sure, a filtering nozzle may be fixed on the inlet and outlet pipes.

The lime-water is prepared simply by dissolving a good handful of quicklime in a pail of water. This *lime-milk*, as it is called, should be added to the water to be softened in proportion to its *hardness;* for every degree of hardness one pint of lime-water will be required to soften eighty gallons of water. Thus to soften eighty gallons of water of ten degrees of hardness ten pints of lime-water will have to be used.

The Porter-Clark Process.—In some large laundries, and in most of the leading dyeworks, water is softened by the Porter-Clark process, which is simply the utilisation of the lime-water plan combined with elaborate systems of mixing and filtration. If vast quantities of water have to be operated upon this process proves highly economical, but the first outlay for machinery is heavy.

Phosphate of Soda Process.—An American system of softening and purifying water with phosphate of soda is said to be rapid, efficient, and economical when carried out on a large scale. Water must be run into a settling tank, and its degree of hardness ascertained. For every degree of hardness take five grains of phosphate of soda per gallon of water to be operated upon. Mix the salts in a pail of water and pour in the solution: the precipitation commences at once; the deposit (phosphate of lime, with, probably, traces of other mineral or organic matter) makes a splendid manure, which will always find a ready market.

Finally, we must lay stress on the fact that on the purity of the water used rests the possibility of success of all laundry work.

CHAPTER IV.

SOAKING AND REMOVAL OF STAINS.

Soaking—Javel Water—Lessive Water—Soda—Borax—Preparation for Soaking—Removal of Stains—Mildew—Ink—Marking-ink—Rust—Paint and Tar—Tea and Coffee—Wine—Fruit.

As a preliminary remark we must warn our readers against all attempts to scamp laundry work; the necessary stages of cleansing must be gone through, or disaster will be the result. There is no royal road to allow of cramming two hours' work into one.

Soaking.—The soaking of linen is one of the indispensable preliminaries to successful washing. If dirty linen is placed in a copper, with or without soap or soda, and boiled, the effect is literally disastrous, both to the appearance and the healthiness of the clothes; for in this case the dirt is rather hardened and driven into the tissues of the fabrics than driven out, and the very presence of soap and soda helps towards such undesirable ends.

The linen, which has been already sorted into various bundles, should be taken into the washhouse from the receiving and marking room, and placed in large tubs or coppers of cold or barely tepid soaking liquor. This liquor varies greatly. It may consist merely of water in which a little good soap has been lathered, or in which soda or borax is dissolved. We, for our part, prefer borax and disapprove of soap at this early stage; other people prefer to use *javel-water* or *lessive.*

Javel Water.—Javel-water is especially affected by washerwomen on the Continent: it is merely a strong soda lye. Take four pounds of ordinary washing soda and dissolve it in a gallon of soft water; boil this for ten minutes, then add one pound of chloride of lime. This precious preparation should be allowed to cool before using; it should be kept well corked in a jar; and we earnestly advise our readers never to uncork it.

Lessive Water.—Probably ever since textile fabrics first came into fashion the cleansing powers of potash salts have been recognised and utilised. In one way or another potash has entered into the manufacture of detergent preparations for very many centuries. The earliest soaps that are known to us were merely a crude admixture of mutton fat and the burnt ashes of certain shrubs and seaweeds. The Roman soaps were all soft soaps, owing to their employing only potash salts, which prevent the saponified fats or oils from solidifying. But for a long time potash salts were only made use of in a very primitive and uncertain fashion, the salts being collected by pouring boiling water over wood ashes. To this day in Italy, Southern France, and some parts of Switzerland and Germany, potash salts are thus collected for the periodical family wash.

The ordinary way of proceeding is to pack the soiled linen in a tub provided with a hole at the bottom. A series of coarse clothes are placed on the top of the linen, and then a quantity of wood ashes are heaped up, boiling water being poured over them, and allowed to filter through the mass of clothes and escape by the hole at the bottom. This method is most effectual, and if adopted after a thorough hand-scrubbing, instead of boiling, the linen comes out a beautiful colour. But this process must not be abused for fine linens, as the potash salts are very strong.

Many people collect the lessive water and use it as a soaking liquor. On the Continent lessive is sold in liquid form by the bucket: it is always to be obtained at the public washhouses. It is also to be had in a solid form—that is, the potash salts and other earthy deposits are collected from ordinary *lessive* water and either sold as a powder or in solid cakes. The use of *lessive* water is decidedly beneficial, but it requires much care in manipulation.

Soda.—Soda is a salt which is found in a native state, and is collected for purification; but the vast percentage of our common soda (carbonate of soda) is manufactured from chloride of sodium (common salt). There are now several processes for its manufacture, but we need not stop to consider them in detail. The processes roughly consist of obtaining sulphate of soda and hydrochloric acid from common salt, then converting the sulphate into black ash, and finally the black ash into carbonate of soda. Soda crystals, or *washing soda*, is obtained by dissolving black ash in hot water, filtering the solution, and after boiling, allowing the salts to crystallise. Soda is used in the laundry partly on account of its softening effects on hard waters, and partly because it possesses high detergent qualities. It acts as a solvent of all fatty acids, and allows them and other accumulated matter to be washed out. Soda used in too great a quantity has a destructive effect on linens and woollens. Mixed in a small quantity of warm water, it makes a mild lye, which may be added in moderation with advantage to the soaking fluids for much soiled or greasy goods.

Borax.—Although soda seems to be much more in favour with modern washerwomen, borax has a far longer and more innocent history. Borax, while not violent in its action like soda, has a powerful effect in softening water and dissolving fats, starches, &c. If dissolved in hard water and soiled linen be placed in it, the dirt is soon loosened in a marvellous manner and is then easily washed out. Borax seemingly has merely a softening effect, for, notwithstanding its rapid and radical action on dirt, it does not attack either cotton, wool, silk, or linen; neither does it disturb the dyes. Moreover, borax has no other effect on water than softening it; thus it may be safely used in all soaking, washing, and rinsing waters. It should be employed in almost all cases instead of soda. One tablespoonful of prepared Californian borax to every gallon of hot water will make an effective soaking fluid.

Preparation for Soaking.—Whatever soaking liquor is employed, it is essential to place the linen in separate tubs, keeping table, household, and body linen apart. We should also strongly advise the dividing the body linen into three or more batches, according to kind. Stains should be slightly rubbed after being dipped in the soaking liquor, and then the linen is packed loosely in the tubs and allowed to soak in the *tepid* (not *warm*) water for ten or twelve hours. The tepid water and detergent agent combined softens the dirt and materially helps to simplify and hasten the after operation of washing. Hot and warm water, on the contrary, tends to fix the dirt on the linen.

As a rule, it is well to put the linen to soak in the evening and allow it to remain all night. If this plan is adopted, take care that the lessive or soda lye (if used) is very weak, or mischief will follow. In the morning the linen must be taken out and wrung. After this all stains should be looked to, and when serious removed before the linen is sent to the washing tubs or machines. In the cases of mildew or ink stains, however, the stains should be removed as far as possible before the soaking.

Removal of Stains.—This process is much dreaded by many housewives, and even by professional laundry people; but though the process may take up time it is fully worth the trouble, and, if the turning out of good work is aimed at, is essential and really saves after-labour. It is well to remember that precautions should be taken thus early, because soap combined with boiling or hot water goes far to make most stains permanent.

Mildew.—Linens and other fabrics having mildew blotches must be set apart for treatment before other articles are contaminated. Spread the stained parts over some hard surface, take off as much as will come away upon a rag, rub in a little salt, and then sprinkle liberally with chalk, which must then be moistened, and the article dried slowly. It may be necessary to repeat the process, rinsing after each operation. If the drying can be done in the sun, so much the better.

Ink.—Dip all articles having ink stains in boiling water for a few minutes. Tighten the part to be treated over a bowl and rub in some salts of sorrel. Rinse thoroughly. Salts of sorrel are poisonous, but will not damage textile fibres. For the removal of copying and marking inks, wash the parts with a strong solution of bleaching powder; then apply a cold solution of oxalic acid. Rinse in cold water.

Rust.—Rust should be removed with salts of lemon well rubbed in on the wet fabric.

Paint Stains.—Turpentine will remove paint stains, when fresh, from any textile. When the paint is dry, mix a little ammonia with the turpentine; saturate the paint, and, when soft, wash out with some soapsuds. If the stain is still obstinate when on wools or cottons, butter or oil the stain and then apply chloroform.

Coal Tar.—Tar, and paints with a tar basis, are best removed with benzol.

Tea and Coffee.—When any article has had tea or coffee spilled over it, be careful not to allow soap to touch it till the stains are removed, for the alkali in the soap will make the colouring matters turn into "fast" dyes. Spread the stained parts over a cup or basin, and pour clean, soft, boiling water through it. If the stains prove obstinate, rub in a little powdered borax and pour on more boiling water; then place the article to soak.

Wine.—Spread the stained part of wine-covered tissues over a bowl or basin, rub some common salt into it and pour boiling water through. Persist in the operation until the stain disappears or grows very faint.

Fruit.—Proceed as for wine, but substitute salts of lemon for the common salt. This has generally the desired effect. But it must be remembered that most fruit stains are true dyes, and very often only time will completely take them out, unless extreme measures (bleaching with powerful chemicals) be resorted to. We would advise, as a precautionary measure against bad fruit stains, that table linen, pinafores, &c., should always be starched in a weak solution, prepared from good stiffening and penetrating starch. If stains were washed when quite fresh with plenty of pure water only, in order to prevent the stains spreading, if the stained part was held immediately tightly over a cup and water poured through it, they would rarely prove permanent.

Grease.—Machine and other grease and oil may generally be removed from linen and cotton by pouring cold rain (or other really soft) water through the spots; borax will help.

When chemicals have been used for the removal of stains, the hands should be washed at once, and rinsed in a little aromatic vinegar. This will prevent the hands being discoloured, and will kill all disagreeable odours.

Poisonous Chemicals.—Some of the chemicals we have recommended in the foregoing hints are violent poisons, and these should be kept in well-corked blue-coloured bottles, and put away when not in use in a safe cupboard. Such precautions are essential in all large establishments, and should on no account ever be neglected.

CHAPTER V.

WASHING.

Preliminary Remarks—Hard Water and Soap—First Wash—Boiling—Hand Scrubbing—Steam—Eau de Javel, or Lessive—Coloured Fabrics—Silk—Prints—Cashmere—Alkalies—Soaps—Soap Adulterations—Detection—Water—Resin—Gritty Additions—Bleaching—Paraffin—Solid Paraffin—Paraffin Soaps—How to prepare Paraffin Soaps.

Preliminary Remarks.—The linen having been duly soaked, and all stains removed as far as they possibly can be, it is now ready for the wash-tub.

It is a self-evident matter that the operation of washing is designed to get rid of the accumulated dirt. But although this is the primary object in view, it should never be forgotten that such operations, while being carried out most thoroughly, should not cause unnecessary wear and tear to whatever fabric is in hand. This, only too often, is lost sight of. The old fashioned method of beating and scrubbing linen with wood instruments and hard brushes does the work well, but it is eminently destructive. The dirt accumulated in the texture of the fabric must be got rid of rather by a judicious process of loosening the hard particles and dissolving the fatty acids and flushing them out, than by mere forcible friction. This is the reason why we use alkalies in our washing operations. Soaps and alkalies are used because through their chemical action they help in the process of dissolving fatty acids and glutinous matter, thus setting free the accumulation of inorganic particles. It is well to thoroughly grasp this principle before starting, as it will at once show the right methods to be adopted and the wrong ones to be avoided.

Hard Water and Soap.—If soiled linen is boiled in a hard water with a soap containing an excess or full allowance of alkali, certain important chemical actions are at once set up. The heat and mechanical motion of the water have a tendency to dissolve the fatty acids on the linen and expel the dirt, but the heat also dissolves the soap, and as hard water invariably contains lime in some shape or other, the alkali in the soap at once unites with the lime in the water and is precipitated in the form of an insoluble lime soap. This deposit is attracted to the linen or wool actually being boiled, forming a thin coating round every thread or hair. The consequence is, the dirt is no longer acted upon by either the water or soap, and is not dissolved, but, on the contrary, is imprisoned in the tissues of the fabric.

To make linen so treated (or rather, so ill-treated) a good white is a difficult matter, and can only be accomplished by a harmful amount of friction, and the use of powerful alkalies in one form or another. This is a very bad method, and yet the boiling of soiled linen is a common practice. As we have already demonstrated, linen should be soaked (in cold or tepid water) before it is washed, but never boiled until the first coating of dirt is removed. We have shown in a previous chapter the best and easiest methods of neutralising and getting rid of limes and silicates in hard waters, and making such waters sufficiently soft for our special requirements.

The First Wash.—Whether the linen is to be washed by hand or by machinery, the same principles should guide each operation. The first thing to be done is, by gentle friction, with the aid of soap, to expel the loosened dirt from the previously soaked linen.

In the case of hand labour, the linen is generally washed in warm water, the soap rubbed on, and then piece by piece scrubbed on a board.

For machine operations a liquor is always prepared by dissolving soap chips in warm water, and causing it to lather thoroughly. An excellent washing liquor is prepared by dissolving three pounds of good bar soap in half a gallon of water; when properly mixed add an ounce of borax, an ounce of soda, and a teaspoonful of turpentine (or better still, two tablespoonfuls of paraffin): when the mixture cools, it becomes a solid mass, and may be cut into bars or chips. For machine washing, neck-bands, wrist-bands, collars, and other soiled parts are usually rubbed with a little of this soap previous to putting the linen in the machine.

Boiling.—If the soaking has been properly attended to, a gentle rubbing in soapy water ought to be sufficient to remove all dirt. The linen should then be wrung, and placed in a copper full of water in which soap chips have been cut, and thoroughly boiled for ten or fifteen minutes. This operation of boiling can now be effectually done in most washing machines.

This boiling is a vexed question. Whilst all practical laundry folk condemn the boiling of soiled linen before soaking and washing, many declare the process of boiling to be altogether bad. They urge that soaking and washing ought to be sufficient to cleanse and whiten any linen, and that constant boiling ends in giving the linen a yellow tinge, which is never contracted in the washing machine, but is due to the effect of boiling. For our part we advocate moderate boiling of linen, but only after the linen has been thoroughly washed, and the greater part of the soapsuds got rid of by a first warm water rinsing. We, however, much prefer steaming to boiling.

It will be seen that, practically, washing consists of three distinct operations: soaking, scrubbing, and boiling or steaming. This sequence of the operations should never be changed.

Boiling Bags.—When linen is boiled in an ordinary wash-house copper, and not in the machine, it is usual to place the linen in large bags. These bags may be made of calico or other similar stuff, but many people prefer to use bags made of strong twine netting. This keeps the linen together, and to a large extent prevents its rubbing against the copper. It is usual to separate the linen in different bags, just as we have shown is the custom when preparing soiled linen for soaking. One or more bags of linen may be boiled at the same time in one copper, but plenty of room should be allowed.

Hand Scrubbing.—As a general rule, after the final boiling or steaming most linen is quite clean, and has a nice white colour; at this stage it is rather the white of milk than that of snow; the latter hue is only attained after blueing. Occasionally, however—and this applies more especially to machine-washed body linen—linen that was very much soiled may have to go back to the scrubbing tub a second time to have any particularly obstinate patch or stain removed. After this, the linen is ready for rinsing. But before passing on to this important operation, we must give details for washing various special fabrics, and also make a few remarks on washing by steam.

Washing by Steam.—Washing by steam proper is but little used in England, except in large machine laundries, where steam is used in combination with hot and cold water, not as the principal or only cleansing medium. Steam alone, however, is a splendid cleansing medium.

The ordinary method pursued on the Continent is to soak the linen in a soda or potash lye (*eau de javel* and *lessive*), and hang it up in a wooden vessel or closet, which is air-tight; the steam is turned on by means of a stop-cock, and forces out the air through a vent-hole which is closed when once the air is expelled. After about half an hour's exposure to steam at high pressure, the dirt is quite loosened and is easily removed by rinsing in one or two relays of warm water. This method is also excellent, inasmuch as steam, at a comparatively low temperature is, as we have already shown, now regarded as one of the best disinfectants. Steam in our large laundries is often used previous to the boiling process, the steam being let in the steam-tight wood or iron washing machine (by methods which we shall explain later on); then the steam is expelled, a strong washing fluid introduced into the machine, and hot water turned on, the temperature being raised to boiling point by the help of steam.

There are certain goods that should invariably be washed separately, as they require different treatment. Among these we number flannels, blankets, woollens, and also muslin and lace curtains. Their proper treatment will be dealt with in a separate chapter. But there are a few other fabrics demanding modified methods, and these we shall treat of here.

Coloured Fabrics.—Coloured goods should always be treated apart, and if there is any reason to doubt of the dyes being "fast" ones, the boiling or steaming process should be avoided, and the preliminary steeping reduced to a few hours, soda being particularly discarded as a dangerously disturbing element. When dealing with the doubtful coloured goods, always dissolve a little ox-gall (for dark colours) or borax (for light and delicate tints) in the ordinary washing liquor, as these ingredients will materially assist in keeping on the colours.

Silk.—Silk goods (underwear, socks, handkerchiefs, neckties, etc.) should not be allowed to soak too long; not above a few hours if really soiled, less when possible; they must be washed quickly in tepid water and with mild soaps (no excess of alkali, no addition of soda; but a little paraffin will do no harm); they should be rubbed as little and lightly as is compatible with cleansing them, and rather pulled backwards and forwards in carefully lathered tepid water than scrubbed. Wring cautiously and rinse at once. The safest way to wring out water from delicate silks, etc., is to place them in a coarse towel or cloth, which should then be folded and gently twisted.

Bright-coloured silks should have their tints "fixed" by adding for blacks, blues, and greens a little common salt to the washing and rinsing waters. Pinks, reds, and tender greens are "set" by adding a little pure vinegar to the water. For lilac add ammonia. Ox-gall, however, will be found excellent for all dark colours, and borax for light ones. All these goods must be quickly and thoroughly rinsed, and ironed at once, according to the directions laid down in another chapter.

Prints.—Calico, prints, and light-coloured cotton goods should not be treated with boiling or even warm water. Prepare a good lather in hot water and wash in this when just tepid, avoiding the rubbing on of soap as much as possible. The use of soap-powders for these goods (and, indeed, for most others) must always be avoided, and the process of washing hurried through, and the articles at once rinsed.

Cashmere.—Black cashmere may be washed in warm well-lathered water, rubbing being reduced to the minimum consistent with the object in view, and the water liberally impregnated with ammonia. Rinse in blued water of about the same degree of heat as the washing fluid. Iron before it is completely dry. White cashmere is treated in the same way, only borax is substituted for the ammonia, and very little blue should be dissolved in the rinsing water.

Merino, Serge, and other Fabrics.—Merino and many stuff dresses may be safely washed more than once before being sent to the dyers. Wash them quickly in warm water in which soap has been lathered. Do not rub soap on the fabrics. Rinse thoroughly and quickly, and take proper precautions when drying to prevent shrinkage. Serge is more difficult to treat successfully. Pass the dress or other article rapidly through well-lathered cold water; rinse in slightly warm water.

Stockings and Socks.—Highly-coloured socks should be treated with care. Lather some good soap in warm water, add a fair pinch of common salt. Dip in the foot and rub; when done, dip in the whole sock and rub quickly; rinse, and dry at once. Silk socks should be treated in the same way, then rolled in a towel and the water squeezed out; iron between the folds of a thick cloth. Knitted hose should never be put in hot water; the washing, rinsing, and drying should be rapidly done.

Alkalies.—The use of soda in bulk in washing fluids is not to be encouraged, for, although the practice undoubtedly saves labour and time, it is in the long run destructive to the linen. Borax, on the other hand, may be used with perfect safety, and will be found to save labour and soap.

Soaps.—The question of proper soaps to be used is one of the greatest importance. Inferior soaps, however low-priced they may be, are invariably dear at any price. For not only do they not do their work, but they often spoil the colour of clothes, when they do not destroy the texture. Good laundry soaps are merely animal, vegetable, or mineral fats or oils saponified by the admixture of an alkali. Both the fats and alkali do a share of the work of cleansing. But alkali alone burns the fabrics, while fat alone clings to the goods and prevents effectual cleansing. The process of soap manufacture is not a very difficult one to understand, though it is now much more complicated by reason of the use of palmitine and other vegetable fats and oils, and of paraffin.

Soap Adulterations.—The art of adulterating soaps is commonly carried to a very high degree, and unfortunately causes both a waste and a destruction of property. Some soaps contain a large percentage of "added water" (which, it is always well to remember, the purchaser pays for at the rate of saponified fats). To detect the presence of this added water one has but to weigh a piece of soap, cut it into thin slices, dry these in a slow oven and weigh again; the loss of water, say, above an allowance of 3 per cent., shows the amount of "added water." Such soaps are bad, and often betray another adulteration, that is, the presence of unsaponified fats. Unsaponified fat is merely fat which has not been acted upon by the alkali, and which is sometimes due to imperfect manufacture, or the fraudulent after-addition of more fat or resin. Now resin will not saponify and is quite useless, except so far as it helps the fraudulent soap-boiler. Here, of course, we are not referring to toilet and medicated soaps, but merely to the laundry and household article. To detect presence of unsaponified fats, lather the soap in tepid water; examine the top of the water when cool for grease. Good soaps never leave any greasy scum.

Resin is often used, as it is cheap, but it gives rise to another great evil—namely, the presence of "free alkali," that is to say, alkali uncombined with the fat or in excess of industrial requirements. Now, free alkali will cause much harm; it is destructive to delicate fabrics, discolours linen, and has a very bad effect on wool. Some manufacturers and dealers actually advertise soaps with "free alkali" for use in certain kinds of water and for dirty woollen goods, etc.—this by way of inducement to possible customers; but if alkaline water is necessary, it can always be added at a much cheaper rate (and with greater safety) by the use of common soda. To detect excess of alkali, melt some soap in hot water, and add a standard saturated solution of water and salt (chloride of sodium). The amount of excess is determined by the quantity of standard acid the soap neutralizes.

Gritty Additions.—Owing to a mistaken idea of chemistry and economy, commercial soaps have been "improved" by the deliberate addition of ashes, silicates of soda, and powdered pumice-stone. This notion of "improvement" is altogether a false one, as when a scouring agent is necessary it can easily be added at a cheaper rate than if incorporated in soap during manufacture. Besides, this system has given rise to unblushing adulteration of soaps, not only with pumice-stone and silicates of soda (the latter a great water absorbent), but all kinds of ashes and sands. To detect the presence of such earthy adulterants dissolve some soap in boiling water, stir well and allow to settle; the sediment (if any) at the bottom of the vessel determines the percentage and nature of the adulteration.

This brief outline of soap manufacture and the methods of readily ascertaining whether it is adulterated or not will be a sufficient guide for all practical purposes in the laundry; and it will also serve to show how carefully soaps should be chosen to ensure economy, safety of the linen, and thoroughly successful work. An accurate analysis of the percentage constituents of soaps is an extremely delicate and expensive operation, quite unnecessary for laundry purposes.

Bleaching.—Occasionally linen, even after it has been repeatedly washed, remains yellow. When this is not due to the use of bad soap or water (see previous chapter on water), or to insufficient rinsing in warm water, the linen will have to be subjected to the influence of a mild bleaching fluid. This may be prepared by dissolving a few tablespoonfuls of caustic soda or borax in a pail of warm water. The linen should be steeped in this fluid for some fifteen minutes or an hour, rinsing it well in warm water on removal. Do not use chloride of lime. But for fuller details on bleaching we must send our readers to Chapter VI., where this question is discussed at length. We will merely remark that such fluids ought only to be resorted to in the last instance; good soap and a little borax should be sufficient in ordinary cases.

Paraffin.—This chapter would be incomplete were we not to say something about the use of paraffin in the washtub. We have already recommended its use in preparing washing liquors, but a few more particulars are required. The discovery of paraffin as a detergent in the laundry was a pure accident.

Miss Gordon Cumming startled the laundry world and many homes by announcing her discovery in a Scotch paper. She advocated the use of about half a pound of yellow soap and two tablespoonfuls of ordinary lamp paraffin for a half-full average-sized copper. The linen was to be placed in boiling water and allowed to remain for from fifteen to thirty minutes. No scrubbing was necessary, merely an occasional stir of the linen and copper fluid. Linen thus treated—and table-linen, bed-linen, and body-linen, as well as flannelette, are now treated in this way—merely requires rinsing in warm water, blueing, and drying. In practice it is found that if too much paraffin is used it is apt to burst into flame if a light is brought near to it. If the copper is too full the oil will overflow and make a mess, if it does not catch fire. The one great difficulty in using pure paraffin is that it forms a greasy scum with the soapsuds; this clings to the sides of the copper, and if it once gets rubbed into clothes great difficulty is found in getting rid of it. It is, therefore, absolutely necessary to carefully skim the boiling water at frequent intervals. It is found that, as a rule, linen washed in this way, if well rinsed, does not smell of paraffin, the colour is usually excellent, and most dyes are not disturbed. Bags and nets are not wanted when paraffin is used.

Of course this method is a source of great economy, as less time is spent in washing, and practically no labour. The paraffin oil is cheap. It is remarkable that we have here to reverse all the known rules of good laundressing; there is no soaking, and the dirty linen is placed directly into boiling water!

Solid Paraffin.—In actual work the practice does not come out so brightly as its advocates would have us believe; there are many dangers and drawbacks attached to the use of liquid paraffin, or the oil in its solid state, such as "paraffin washing blocks," *laundrine*, etc.

Paraffin Soaps.—Undoubtedly paraffin possesses positive detergent powers, and although experience inclines us to disapprove of the employment of pure paraffin, we think that a small quantity mixed in melted laundry soaps will prove a source of benefit. Many of our leading soap-boiling firms are now actually making use of paraffin. In some instances the paraffin is intimately mixed with the purified fats or oils to be saponified by the alkaline lye; in others the paraffin is only added after saponification. Laundrymen may now choose their paraffin soaps among a large number offered for sale, or they may easily prepare their own.

How to prepare Paraffined Soap.—Slice a few pounds of good yellow laundry soap, melt with a very little boiling water, mix in a little paraffin. Allow the mass to cool and solidify. The usual proportions are, one tablespoonful of paraffin to every quarter of a pound of soap. This soap is allowed to harden into blocks for storage, and when wanted it is cut into the usual chips or shavings.

CHAPTER VI.

RINSING.

Rinsing; Warm and Cold Water—By Machinery—The Use of Chemicals —Bleaching—" Black Spots;" way of avoiding them.

Rinsing.—Few operations are more important to the laundryman than rinsing. Much will depend upon the early and effectual rinsing of all washed linen, but more especially when this linen has to be starched and ironed. Bad rinsing will generally be found to be the principal cause of yellow or greyish-coloured linen, or the appearance of streaks and black spots, besides many other crosses of the laundryman's life. For by proper rinsing we do not merely get rid of the dirty water and sticky soapsuds which may cling to the linen, but we actually dissolve and expel the soap which is intimately mixed in the very tissue of each article. It is, therefore, a grave mistake to plunge the linen roughly wrung from the warm soapsuds of the tub or machine into *cold* water. By this method the soapy water and suds may be driven out after much agitation in plenty of pure water, but the soap in the tissues is hardened, and in the long run gives a bad colour to the linen, besides causing many troubles in the ironing room.

Let the linen on removal from the washing machines be rapidly passed through a pair of wringing rollers, and conveyed to a tub of *clear, warm water,* or to a dash-wheel rinsing machine. The linen must then be thoroughly agitated, when the warm water will dissolve out all traces of soap. The linen should then be finished off by rinsing in *cold water.* The operation of rinsing must be done deliberately, so that the clear water—and both the warm and cold supply should be plentiful—may remove every trace of soap, a point upon which too much stress cannot possibly be laid.

Machine Rinsing.—The modern dash-wheel and other mechanical rinsers will be found exceedingly useful and labour-saving. In choosing such machines only those provided with a hot and cold water supply should be entertained.

Of course the operation of rinsing may perfectly well be carried out in the various types of washing machines. It is only necessary to see that the machines are carefully washed out with *hot* water to free them from suds, etc., before the rinsing water is placed in them.

We strongly advocate rinsing linen by machinery because the operation is so important in every way, and if carried out in machines is likely to be far more thorough than if the linen be merely agitated in tubs by the hand or poles; and on a large scale it is also more economical.

Bleaching.—In some large laundries a preliminary rinse is given in warm water, and then the linen is placed in a bleaching liquor for a short time. Such bleaching liquors are sometimes merely *soda lyes*, but at other times consist of a bath prepared with hot water and *chloride of lime* or *hydrochloric acid*, in its crude form, or in the shape of some manufactured bleaching powder or fluid. After soaking in such a bath for a short time—varying according to circumstances from five minutes to half-an-hour—the linen is wrung, rinsed in tepid water, and then finished off in cold water.

The Use of Chemicals.—We unhesitatingly deprecate all use of "chemicals" in laundries. By "chemicals" we mean not only strong soda or potash lyes, but also bleaching powders and fluids, in which latter category we include most *soap powders* and *soap substitutes*. The real basis of soap powders is almost invariably chloride of lime. Of course chloride of lime properly employed is a useful and necessary bleacher of raw fibres and freshly manufactured textile fabrics. But the constant use of such powerful chemical agents in the laundry cannot do otherwise than have a detrimental effect on the linen. In very large laundry establishments the occasional use of a bleaching fluid cannot well be avoided. Linen of all kind, and coming from all quarters, finds its way into the wash-house, and in many cases the linen is so soiled and discoloured that mere soaking and washing is not enough to restore a snowy appearance to it. In such instances a short soaking in a mild bleaching bath may be resorted to. Such bleaching baths had better be prepared with boiling water and soda, or, for choice, borax. About two tablespoonfuls of either salt to one gallon of water makes a strong bleaching lye; it may be diluted according to the requirements of each particular case. Chloride of lime or bleaching powders had much better be left to the professional bleacher and kept out of the laundry altogether.

Although our experience teaches us that the popular cry—now happily fast dying out—of excessive use of chemicals in steam laundries is nothing but a popular delusion, taking the laundry trade as a whole, still we must acknowledge that some of these establishments deserve censure. There are men and women in the laundry trade who are constantly occupied in "cutting prices"—that is, endeavouring to do work at prices much below those charged by their neighbours. Now laundry work cannot be done thoroughly and conscientiously below a certain price; those persons who attempt to do so only succeed by paying starvation wages to their assistants and scamping their work. The preliminary soaking is dispensed with, the washing and rinsing hurried through with quite undue haste, and then an attempt is made to set matters right by the use of powerful bleaching chemicals. Linen may be sent home from such establishments white enough to please the most fastidious of country matrons, but such linen will have but a short life. We must, in justice, say that this kind of work is the exception to the rule, for it is suicidal; and traders, if only for their own sakes, are naturally chary enough to adopt these reprehensible methods. Unfortunately, however, there are a few men who do carry on business on these lines, and give a bad name to the trade; they are a general nuisance, and the public should do all in their power to put them down. The matter virtually rests with the public. Let the public decline to patronise establishments where the "cutting of prices" system holds good, for there the work is carried on by means of the "sweating system" and a lavish use of the dreaded "chemicals."

Black Spots.—Very frequently body linen that has been well washed, and when dry looks beautifully white, on being starched and ironed becomes spotted all over. The hot iron seems to bring out a kind of black rash over collars, cuffs, and shirt bosoms, even frills being subject to the distressing malady. These spots and streaks vary in hue from the lightest grey to a decided black. The hot iron is here the means of betraying faulty work, a circumstance which is all the more annoying because it is only found out so late in the day. Then, as a rule, when black spots do appear, the effect is so great as to make the rewashing of such body-linen a necessity.

The original cause of black spots has been a much disputed point among practical laundrymen. It would seem, however, that these greyish blemishes may be set down as due to two distinct causes—in the first instance to natural animal fatty secretions, and in the second to dirty soapsuds. In both cases the disturbing cause gets imprisoned in the folds of the cuffs, collars, etc., and its presence is made manifest by the hot iron. The sweat of some persons has a more decided tendency to cling than that of others, and we know that the characteristic of sweat differs widely according to the constitution and bodily health of individuals. In many cases this glandular secretion has a very high colouring power, and if it, at the same time, possesses a clinging tendency, making the removal of it a difficult matter, mischief is bound to follow if care be not taken. Experience will do a great deal to help the housewife, and will also stand the trading laundryman in good stead; but experience is an expensive and trying school, so it is well to take any possible precaution beforehand. Prevention is better than cure. When body-linen appears much soiled with sweat, more especially the edges of collars and cuffs, or if it is known that the wearer suffers from agues, fevers, jaundice, etc., rub them separately with a little of the soaking fluid before placing them in the tubs. On removing, previously to placing them in the washtub or machine, rub the edges and stained parts with plenty of soap. These are the principal preliminary precautions: now while washing, etc., keep them as much as possible apart from the other linen. But the great secret for the prevention of black spots, whether caused by acrid sweat secretions or dirty suds, is thorough and prolonged rinsing, first in warm water, and then in cold. If this rinsing was more carefully attended to, laundrymen would have fewer occasions to bewail the necessity of rewashing and starching "black spotted" body-linen.

It is sometimes permissible to dissolve a little blued starch or gum arabic in the last cold rinsing water. This is done for silk neckties, muslins, ribbons, etc., which must be ironed and appear slightly stiffened, and yet will not bear heavy starching. In these cases dissolve the blued starch or gum arabic in a little warm water, and add this in a small proportion to a large quantity of cold water. In all other cases the rinsing water should be perfectly pure and clear.

CHAPTER VII.

WRINGING AND DRYING.

Wringing—Machine Wringing—The care of Rubber Rollers—Hydro-Extractors—Drying—Methods of Drying: Open Air; Warm Rooms; Drying Closets; Drying Horses.

Wringing.—The removal of superfluous water from any article of clothing or linen seems a very easy and simple matter to the uninitiated. But there is a right and a wrong way of wringing linens and woollens, and although the process has now been greatly simplified by putting the goods between wood or rubber-covered rollers, there are still precautions to be taken.

Much destruction is done by the old hand-wringing, as many people calmly take hold of an article anyhow, and twist it round with all possible force until every fibre of the tissue is strained unnaturally. The water should be got rid of, as far as possible, by a gentle, sustained pressure, not by wrenching. When wringing by hand, too, be careful to twist the articles selvedgewise, as this will considerably lessen the destructive tension.

Machine Wringing.—As we have already observed, most wringing is now done by machinery; it saves time and causes less wear and tear to the linen. Wringing rollers of one kind or another are now attached to many washing and rinsing machines, and they are also made in several convenient forms and sizes, with fittings which allow of their being attached to any tub or table. The linen had better be passed through the rollers after each operation, that is, after soaking, after washing, and after rinsing. In most cases the same rollers will be used for each operation. Be careful, therefore, to thoroughly cleanse the rollers with a wet sponge or cloth, to remove all possible particles of dust, soapsuds, etc. It is a great mistake to screw up the wringers too tight. This strains the machine and the linen. Regulate the pressure of the rollers according to the work to be done. Some rollers have an automatic adjusting gear, but others will have to be constantly regulated. The two first operations—wringing after soaking and after washing—need not take much time. But the third operation—after rinsing—requires more attention and care.

For this last operation see that the rollers are properly adjusted. Take up each item of linen, shake it out, and fold neatly, placing one end between the rollers and work it through slowly and carefully. See that the wringing is done selvedgewise. If the wringing is not too rapidly hurried over, the linen will be better deprived of water, and will dry without showing ugly signs of having been pulled out of shape. Many garments, especially prints, some woollens and silks, are spoilt by being unduly strained in a wrong direction while being wrung. This can easily be avoided if attention is paid to the work.

Buttons should be hidden away in the folds of the fabric to which they are attached. This will not only prevent the buttons being broken, to the annoyance of everybody concerned, but also preserve the rollers from damage. Both wood and rubber rollers are constantly spoilt by being marked, more or less permanently, by such hard substances as mother-of-pearl, china, or metal-rimmed buttons. The exercise of a little common sense will enable anyone to avoid these very considerable annoyances.

The Care of Rubber Rollers.—Rollers of all descriptions ought to be kept clean and freed from undue pressure by relaxing the gearing when the machines are not in use. These precautions are specially needed in the case of rubber and other composition rollers. When the rollers have been washed after use they should be dried with a soft cloth.

Rubber rollers get worn out after long or severe usage, but that does not render a wringing machine useless, as the rubber coating of the rollers can be replaced. This operation is a delicate one, but it may be undertaken in the laundry itself. Instead of sending the rollers to a laundry engineering firm, procure good rubber casings of the size required. Tear off the old worn-out rubber from the rollers and clean off the old cement with a sharp knife. Prepare some fresh cement by dissolving fine chips of rubber in benzine. To make a pint of this cement, use about an eggcupful of chipped india-rubber. Now whip the roller firmly with strong twine. Cement this thoroughly, as well as the inside of the new rubber roll, which must be pulled on, and then smoothly covered with thick cloth, which must be tied all the way along with strong cord. When dry the rollers may be replaced in their bearings.

Never forget after the day's work to relieve the pressure on the rollers, and oil the bearings and other working parts of the machine, taking care to remove at once any signs of excess of the lubricant.

Hydro-Extractors.—In large laundries, when once the linen has been rinsed and wrung, it is removed to the hydro-extractors before passing on to the drying-room or closet. Hydro-extractors are circular, basin-like, metal machines, provided with a cage fixed to a movable bottom, which base is driven round by steam or other motive power. When the driving gearing is connected and the machine set in motion, the inner cage is whirled round at a tremendous rate, and the air is forced through the linen, which is packed inside, all the moisture being expelled and drained off by pipes at the base. This process greatly accelerates the drying of linen. These machines are used by dyers and cleaners as well as by laundrymen.

Drying.—Undoubtedly the primitive fashion of drying linen in the open air or in a well-ventilated room is the best plan, but there are many drawbacks to its universal adoption ; it takes much time, and owing to smoke, want of space, and other reasons, it is well-nigh impossible in large towns. Linen is now almost invariably dried by means of heated air. The linen may be simply hung on horses before a fire, or on lines stretched across an artificially heated room. Many of the drying rooms in large laundries are very elaborate affairs, but there are also some useful portable drying closets, in the shapes of wardrobes or chests of drawers, for use in private houses and small laundries. Where common horses are used for drying linen before open fires, great precautions should be taken. Only too often serious accidents are caused by linen being placed too near grates, when the linen becomes as dry as tinder and finally bursts into flames. And then again, if placed too near an open grate, the linen, if not burnt or scorched, is frequently discoloured or covered with "blacks."

Methods of Drying.—The drying of fabrics differs according to the texture of the articles. Silks should have the water squeezed out, and then be subjected to a rapid drying process and ironed while slightly damp. Delicate silks may be rolled in a towel and the whole twisted round—this lessens the strain ; but in any case, though silks must be dried rapidly, they must not be put before a fire or dried by application of any unusual degree of heat. Linen and cotton goods may be allowed to dry at leisure, provided they are spread out on frames or over cords; linen must not lie in baskets or tubs in a heap while damp, as this spoils the colour and rots the fibres. Flannels and woollens should be stretched in all directions (but very gently), and, if possible, pinned to frames and dried rapidly, but not before a fire. Prints also require rapid drying, and so do most coloured muslins. If muslins, prints, silks, &c., cannot be ironed at once, *while still damp*, dry them off quickly, and redamp them when about to iron. Silks ought not to be sprinkled, but should be covered with a moderately damp piece of muslin or fine cambric. If these fabrics are allowed to remain in a damp condition for any length of time the colour and general appearance suffers considerably. Muslins and lace curtains require peculiar care in drying; when and where possible, curtain drying-frames should always be used.

CHAPTER VIII.

BLUEING.

Preliminary Remarks—Blues—Liquids and Solids—Indigo—Ultramarine—Aniline—Preparing the Blueing Liquids—Various ways of Blueing—The Use of Acids—Prevention of Streaks.

Preliminary Remarks.—We must at once say that no absolute rules can be laid down for blueing clothes; not only will the blues themselves produce different results, but these again will vary with the tissues, the temperature, and the qualities of the water. Bearing this in mind it will be seen that it is chiefly on experience that one must rely in order to avoid mistakes. The great matter to be aimed at is to give your finished goods a uniform and constant tint, and for this the proportions of blue to be used will constantly vary. For instance, very soiled collars and cuffs will not wash so white as new and fairly treated linen: they will come out of the drying room with a more decided yellow hue; and, in order to correct this, more blue will have to be used. The experienced hand can form a tolerably safe idea of how matters are going before the operation of blueing is over, and at once rectify any mistake, either by adding more blue, or if too much has already been used, by dipping the articles in pure water and wringing them. Constant practice will soon make an intelligent person sufficiently expert in this. A collar taken out from the blueing water and held up against the light ought to have a pure sky blue tint; if yellow or green they must be redipped, probably in a stronger solution of blue; if dark blue, rinse the articles in pure water.

Blues.—There are a vast number of laundry blues; they are offered to the public in every shape as solids and also as liquids.

Liquid.—Liquid solutions of blues for laundry use are manufactured with the main idea of saving trouble. These solutions are very strong, and are meant to be mixed in cold or warm water in the proportion desired by each individual. Some of these liquid blues, however, will not readily dissolve in cold water; such brands ought to be rejected; so ought those which require much stirring in warm or cold water before they are diffused, and which subsequently show a tendency to separate or deposit on the solution being allowed to stand.

Solid.—As a rule we prefer solid blues. They are more handy, and their very nature demands greater attention in preparing the blueing bath. Solid blues ought to be firm, but easily crumbled to a fine powder; gritty blues are to be rejected. Also those that, on being broken, appear to be of different colours in parts are unworthy of use, as they have been adulterated. Whether the blues be in squares, ovals, or round balls, does not matter. But it is desirable that they should not be in powders, for when powders are stored they are apt to absorb moisture from damp walls or the atmosphere, and then they soon deteriorate. As a rule it is also well to store them away from the light.

Indigo.—The old blues were nearly all indigoes, and many people still prefer to use indigo square or ball blue to any other kind. Most indigoes are not easily soluble in cold water, and will give some trouble in mixing them uniformly. If used with very yellow linen, indigo gives them a greenish tinge. If used too strong, the blue is too decided, and is apt to come out in streaks or blotches. In using indigo blues, mix them thoroughly, and test the fitness of your liquid upon two or three collars, holding them up against the light to see the effect.

Ultramarine.—Ultramarine is comparatively a new substance for laundry blues. Properly manufactured, it is easily soluble. It gives a dark blue tint, and consequently requires judicious handling. If not uniformly mixed in the water, the blue will sometimes settle on the linen, and then produces unmistakably deep blue ridges or specks. Ultramarine is frequently seen as a liquid blue, for the above reason.

Prussian Blue.—The use of Prussian blue is not to be generally advocated. It lends itself with dangerous facility to adulteration. Even in a pure state Prussian blue is inclined to precipitate (that is, deposit the colouring matter) after mixing. This precipitation occasionally takes place on the articles being blued, causing disagreeable after-results. The blue is also of a dense hue that makes it rather unmanageable to those who are not accustomed to it.

Aniline Blues.—The wonderful aniline blues are largely used. Pure aniline blue gives a greenish hue when the linen is yellow. This defect is remedied by adding to it some red or violet aniline, which gives the linen a slightly purple tint, but which softens down on drying, giving them the desired pure white hue. This mixture of blue with aniline red or violet need no longer trouble the laundryman, as now aniline laundry blues are manufactured with the properly proportioned admixtures. Aniline blue requires careful solution in hot or cold water; if carelessly handled it gives uncertain results. But if blues are bought from firms with good reputations, the strength of their manufactures may be depended upon, and then the difficulties mostly disappear.

Preparing Blueing Liquids.—The first thing to determine is the quality of your water, as this will greatly affect the blueing operations. Hard waters cause waste, uneven mixing of the solution, and discolour the goods. Yellow water, again, not only discolours the goods but has a direct effect on the blues. In the country rain-water is good; in the town it will be necessary to filter rain-water. A pure water in colour and as soft as circumstances will allow is what is required. If you have a pure coloured water which is hard, treat it before use as described in the chapter on water, or put it to stand in an open vessel over-night and dissolve in it a liberal supply of borax. Take care that the tub or bath in which the water is placed and the blue is mixed is perfectly clean and free from dust or soapsuds. If you use blue in liquid form add about three to four ounces of it for every gallon of water.

If solid blue is used, enclose the square or ball in a bag made of stout linen (but it should be closely woven). About two ounces of blue to a gallon of water is the usual proportion. When about to prepare a large quantity of blueing water, the blue in the bag may be crushed. Have a hand basin full of hot water, dissolve the blue in this by rubbing and fingering the bag. A little hard insoluble matter will always be left behind, but if the proportion of insoluble matter is great it is a sure sign that the blue is of an inferior quality or adulterated. This strong solution of hot blue may now be poured into the tub or bath of cold or warm water; mix the two liquids thoroughly. If powdered blue is dissolved immediately in water, and not through a bag, it will be necessary to filter it. When only a small quantity of blueing fluid is required, the solid blue need not be powdered, but the bag should be rubbed against the sides of the vessel until the desired density of colour has been imparted to the water. This fluid should be well stirred, but it is wise to make use of it soon, for although good blues ought to be able to stand some time, still a precipitation of the colouring matter does take place in all of them if time be allowed. Blueing water should, therefore, be used up all in one day, and a fresh lot prepared on the next.

Methods of Blueing.—There are various methods of actually blueing linen, partly depending upon taste of individuals and partly regulated by custom or circumstances. There is the hand blueing process, which simply consists in dipping several articles in a blue bath, agitating them in the fluid, and then wringing them. Care should be observed here, as the solution gradually grows weaker; so the last article will come out of a different hue from those first put in.

Broadly speaking, there are two different ways of machine blueing. The first method is simply an improvement on the old hand process. A tank is fixed on standards, and a pair of spring-tightened rubber rollers fixed above it. The blueing fluid is poured into the tank, where the linen is placed, and is either agitated with a round stick or by hand. The linen is then passed through the rubber rollers, and received on the other side on a board, the surplus blue fluid falling back into the tank. The second way is to employ a dash-wheel machine. This machine may either be specially designed for blueing operations, when it is of the simpliest make—usually a water-tight revolving barrel hung on bearings between two standards, and worked round by a driving-wheel or a hand-worked fly-wheel; or one of the washing machines may be used. In the latter case it is essential to see that it is well washed out before being utilised for the present operation.

Where a great quantity of linen has to be blued, we would strongly recommend the adoption of the latter process. The reason is simply this: a measured quantity of water of a known density of hue is prepared and placed in the machine, together with the proper quantity of linen (the same quantity of linen in proportion to water as adopted for washing in the machine), and when the door is closed the whole is whirled round for five or ten minutes. Now, in this way, a uniform tint may be given to all the linen. As the blue water weakens it ought to be run out, used for more delicate fabrics (such as require less colouring), or strengthened with a strong blue solution up to the proper hue. The successful laundryman never does anything haphazard; he knows exactly what he is aiming at, and what he is doing to hit the mark.

The linen must be blued separately, that is to say, a machineful of cuffs and collars, then of shirts, body-linen, handkerchiefs and such kind of articles, table-linen, household linen, all being blued in batches. As a rule, body-linen requires most blue; table-linen least of all. Hotel table-linen, however, which is so frequently washed and has to be got up with great rapidity, generally requires much care in rinsing and blueing in order to get it fairly white. By thus keeping different kinds of goods apart, greater uniformity in the net results will be obtained with the least worry. The length of the operation, when carried on by the dash-wheel machines, should not be more than ten to fifteen minutes at the outside. Remove the linen from the machines and pass it through a wringing machine, from whence it may be taken straight to the preparing room, and be starched. Linen when taken out of the blue bath ought not to be allowed to lie in a heap for long, or streaks will probably mar its appearance. Many people who carry on laundry work on an extensive scale find that by adding a little good starch to the blue water (when aniline blue is employed) better and more uniform results are obtained. But if good aniline laundry blue be used, and the hints here given properly followed, no difficulty need be apprehended when experience has brought about the necessary power of quick judgment. A properly blued (aniline) article of linen ought to have a slightly purple hue, quickly changing to blue on exposure to the air, or after being starched.

The Use of Acid.—Too many laundrymen advocate the use of some kind of acid as a mordant for blueing. The acid is generally added to the last rinsing water; only a little remains in the linen, but just sufficient to "sour" the linen, and cause the blue, more especially aniline, to cling to the fabric and give a good colour. Others add the acid to the blue water, but only when it is well diluted, for if added to the first strong solution it would cause the blue to precipitate. The use of acids, however, is not at all necessary, either in the rinsing or the blueing waters. The pure diluted solution of the prepared liquid or solid blue, as we have explained, is all that is really required; and this will best answer the purpose of all conscientious men and women.

Prevention of Streaks.—Few things are more annoying than to find that properly washed linen, after being blued and mangled or ironed, shows blue streaks. The way to escape these disasters, for such they are when occurring wholesale in a large wash, is to rinse your linen thoroughly. The presence of the least trace of soap will have an injurious effect on the blue. The blue should also be most thoroughly mixed, and the articles dipped in entirely, not partly; there ought to be enough blue water to allow the articles to float about in it easily, when they can be completely and uniformly soaked. If any more strong solution of blue has to be added to increase the hue, do this when there is no linen in the bath. On removing the linen from the blue water, shake out each piece, and pass it through the rubber rollers evenly. Have the linen starched immediately, or, if it is dried first, then stretch it out before hanging up to dry. If blued articles of wearing apparel or table-linen are put aside in a heap on removal from the bath, or even after being wrung, the blue water tends to centre in certain spots or ridges, and then on drying the streaks and specks become only too apparent.

One occasionally meets with laundry people who suggest the using of a special blue for different goods—aniline or indigo for body-linen, ultramarine for curtains, dimity hangings, etc., and so on. We think this is a mistake. It is far wiser to try a few good blues, and find out the one that suits those using it, and then always stick to that particular brand. In this way one becomes familiar with the blue, and the question of quantities, working, etc., becomes much easier, enabling good results to be got without difficulty.

CHAPTER IX.

STARCHING.

Starches; rice, maize, potato, &c.—Their Relative Strengths—Starch Substitutes—Starch Glazes—Various ways of preparing Starches—Hot Process—Cold Process—Addition of Glazes—The operation of Starching—Modification according to Fabrics.

Starches.—The stiffening and other qualities of starch vary so widely, according to the substance from which it is derived, that the choice of a good starch becomes a matter of importance. Inferior starches are adulterated with common flour, plaster, and other useless or harmful ingredients. There are no easy ways of detecting adulteration; you must judge by results, except, indeed, when a starch turns out to be largely insoluble, when, of course, it must be rejected. But the solubility of starch is not a safe guide, and the only feasible precaution is to buy starch from a reputable firm. Persons doing laundry work on a large scale may often find it useful to have an analytical trial made of starches before choosing any special brand. But there are a score or more of houses whose products may be relied upon for purity and care in manufacture.

Starches are derived from many different grains and pulse.

Rice Starch.—The old-established wheat starch was found to be rather uncertain in use, and, to a large extent, destructive to fine linen. Wheat starch in practice is generally found to contain whity globules of gluten, and this gluten will show itself on glazed surfaces of linen after ironing, in semi-transparent patches. Thus, in spite of its high stiffening powers, wheat starch is unsatisfactory. The now almost universal substitute for wheat starch in fine work is derived from rice. Rice starch is obtained in very small globules of great regularity in size ; it possesses high stiffening powers, but is easily soluble, and, therefore, capable of being diluted to any desired strength. It is an expensive starch, but, having regard to its durability and other good points, it must be regarded as an economical one. In a pure state it mixes into a perfectly smooth paste, and when diluted gives reliable and equal results. Rice starch is not infrequently mixed with some other starch, such as potato or maize, for the sake of economy. If the proportions are fairly calculated and the mixing of the two thorough, a very good starch may be obtained ; but here the consumer will have to depend for results almost entirely on the honesty of the producer. For if the usual proportions are not invariably observed, or the mixing not sufficiently intimate, disaster is sure to supervene.

Maize.—Indian corn or maize is now much used for procuring laundry starches. Indian corn is cheap, and contains a large amount of rather coarse starch. Maize starch is manufactured in many different forms. As a rule, it is coarse, and less opaque than rice or wheat starch. Dissolved in a little boiling water and then diluted, it gives a strong solution, producing a permanent stiffness on linen. It must, however, be thoroughly well mixed and some glazing medium added, or the starch is apt to give a very stiff but rather rough surface. The semi-transparent form of maize starch, if dissolved in boiling water, has a high stiffening and penetrating power.

Potato Starch.—The starch of potato possesses but a moderate stiffening power. It is easily soluble, and penetrates most tissues satisfactorily; it has no harmful effect on textiles of any kind. It should not be used too strong, or it will make collars and cuffs, especially if of three or four folds, finish off like cardboards when ironed.

Other Starches.—Rye, barley, arrowroot, and many other grains and pulses are used for extracting starches, but practically these do not touch the market. Sago, however, is preferred in some laundries; it is not unlike potato starch, only rather finer and more expensive. Tapioca gives a fine starch, which is altogether colourless, easily manipulated, and gives good results for fine work.

Relative Stiffening Strengths of Starches.—Experiments with different starches enable us to give the following useful tabulated information. Starting with a pure starch obtained by maceration and infusion, and taking its stiffening power as 100, we get the respective values of other starches, thus:—

Pure dry Rice Starch	100
Rice Starch, No. 1	95
Rice Starch, No. 2	91
Pure dry Maize Starch	87
Corn Starch	85
Rye Starch	81
Buckwheat Starch	81
Oat Starch	80
Acorn Starch	80
Wheat Starch	80
Barley Starch	79
Bermuda Arrowroot	75
Natal Arrowroot	73
Pure Potato Starch	68
Potato "Farina"	65

Starch Substitutes.—There are a number of "starch substitutes" manufactured under patents, or as secret processes, and offered to the public as advantageous alternatives to ordinary laundry starches. These substitutes are said to offer several advantages; such as being easily soluble by the most inexperienced of persons, giving surer results when mixed by careless persons than starch would do, and being economical. Most of these substitutes are also said to be good glazing materials. Some of them are merely starches with some kind of wax and a white powder (really an adulterant) intimately mixed. They are, as a rule, much easier to handle than even good starches, and for this reason are largely patronised in certain quarters. But a pure starch, in spite of its giving more trouble, will always be preferred by experienced laundry people.

Starch Glazes.—It is usual to mix with starch, when preparing it for immediate use, a little fat or wax of some kind. This is done in order to give a high gloss or glaze to the surface of linen when ironed. These glosses or glazes may vary for table-linen and for collars, cuffs, shirt bosoms, &c. This mixing of grease or wax in hot starches is always a difficult matter, and becomes a serious stumbling-block to the novice and those who are not always at this kind of work. The operation becomes far more difficult when only cold starch is used. People of inventive turns of mind have stepped in the breach to the help of starchers, offering them prepared glazes in such forms that they are easily mixed in cold or hot starches. We cannot here presume to arbitrate between the many contending parties. We can only say that actual experience enables us to assert that there are several starch glazes in the market that may be safely used. As an insight into the manufacture of starch glazes, we give a recipe for a non-patented glaze that has been used for years in a large laundry. Take, for 100 parts of pure wheat starch, 0.75 of stearinic acid (stearine); melt the stearinic acid with about ten times its weight of wheat starch, let it cool, powder, and mix thoroughly with the rest of the starch. This glaze may be used as a starch for collars, shirts, etc., but if used for table-linen and other goods not requiring to be very stiff or highly glazed, add a little unprepared starch. Of course we do not pretend to divulge here the secrets of starch glaze manufacturers, but merely adduce the above example as a hint as to what is aimed at in their preparation. Some starch glazes are sold as powders, others as paste; as a rule those that are soluble both in cold and hot starch or water are to be preferred, being more convenient.

The Preparation of Starch for the Laundry.—The starch having been chosen, it should be packed away in a dry closet until wanted for use; starch will absorb moisture, when it "cakes," and is occasionally damaged. The preparation of starch varies greatly in different laundries. However, it is always necessary to see that the pans in which the starch is prepared are quite clean, as dust, hairs, etc., will cause much after-trouble. The water used ought to be soft and colourless. The use of filtered water in preparing starch will save much trouble. The average proportion of good starch for ordinary purposes is a quarter of a pound for every two quarts.

The Hot Process.—Many people swear by the old-fashioned method of boiling starch. Put your starch in a spotless tin pan and pour upon it a small quantity of boiling water, mix it into a smooth paste with a flat piece of wood; now add the requisite quantity of cold water, stirring well. Put the mixture on a fire and boil for fifteen minutes. Stir into this a little paraffin wax, a pinch of borax, or a lump of sugar; or, instead, stir the boiling starch with a common tallow dip, or a paraffin candle. This is done to make the starch iron smoothly and give a good gloss, but when starch glazes are used these additions may be omitted. It is often the custom to add a little blue-water, or liquid blue, to correct the yellow hue; this is more necessary when wheat or potato starch is used. The starch ought to be strained. Boiling starch is said to bring out to the full the stiffening powers, and also to increase its penetrating qualities. Boiled starch is, therefore, generally preferred for body-linen.

The Cold Process.—To prepare starching liquor by the cold process, place the starch in a glazed earthen basin, add a little clear cold water, and mix into a creamy paste, free from lumps; add more cold water gradually, stirring all the while, until the desired consistency has been attained. When this cold starch is to be used for fine linen, &c., it should be strained through a close muslin bag. The starch is then quite ready for use, and may be further diluted at any time merely by adding water and stirring.

The Addition of Glazes.— Patent, or home-prepared glazes, ought to be diluted before being added to the starch, unless, indeed, the old method of merely adding wax, tallow, or sugar to boiling starch be adhered to. Most glazes may be mixed with a spoon in a cupful of warm or boiling water. Cold water in certain cases is only allowable, but in this matter you must follow the directions of the proprietary firm or manufacturers, or the recipe. The powder or paste must be thoroughly mixed in as little water as possible, then pour into the bowl or pail of prepared starch and stir it. Glazes ought only to be added to hot starches after the boiling process.

Starching.—Starching may be done either by hand or by machine. In the one case the starch is placed in a large basin or a tin pail. The linen is then brought from the drying-room, or wet from the wringer after having been blued. The articles of linen, etc. ought to be placed in the starch one by one, body-linen having the starch rubbed thoroughly well in; table-linen, etc., requires merely to be dipped in, and then is passed through rubber rollers.

In machine starching, the liquid starch is poured into a dash-wheel revolving washer or special starcher, and a certain quantity of linen, varying according to the size of the machine and amount of liquid, is put in, the door is fastened, and the dash-wheel made to revolve for fifteen or twenty minutes. As the thickness of starch varies according to the articles, it is essential to separate the blued linen in bundles; only collars and cuffs, shirts, table-linen, etc., being machine-starched together. If a large quantity of starch liquid is used in a machine, it is usual to starch all the collars, cuffs, and shirts first, other articles following after, and table-linen coming last, or having a special starch of its own. If this way is followed it will only be necessary to dilute the starch with a little boiling or cold water when the articles vary. When starched, the linen should be passed through the wringer.

Having been wrung the linen should be taken to the ironing-room, or be rolled up in bundles and packed safely away in hampers in some place where no dust can come upon it. Smuts, dust, and specks of all kinds cling to damp starched goods, and, although these do not show much when in the rough state, as soon as they are ironed all blemishes quickly become visible. Many of these may be remedied by using a damp sponge (which should be frequently rinsed), but it is better to avoid their production.

Modifying Starches for different Fabrics.—It must not be forgotten that the same degree of strength in starch will not suit all kinds of fabrics. As we have said, collars, cuffs, and shirts require strong starch solutions; but fine linen would not look well or last long if too heavily starched. The solution must be diluted, either with hot or cold water, according to the process employed in making the original strong solution. Muslins ought merely to be dipped in very weak starch water and dried immediately.

In many quarters strong objections are held against starching table linen, it being thought that hot mangling is quite sufficient for good damask. This is a mistake. Table linen, no matter what its quality may be, always looks much better, keeps cleaner, and lasts longer if starched, only the table-cloths, napkins, etc., must not be heavily starched. A very weak solution of good rice or tapioca starch—the latter is colourless and has a pleasant odour—should be used; boiled starch will here save much trouble. This will enable the linen to be got up moderately stiff, and with a nice glaze. The starch, moreover, preserves the fabrics from stains. If the table linen is placed in a plentiful amount of good starch water, and agitated (by hand or machine) in it, a thin coating of starch will be formed round each fibre, and this prevents fruit juice, wine, or grease from penetrating too deep. This "wrinkle" should be particularly noted by hotel-keepers, public caterers, and housewives with large families of young folks.

Coloured fabrics ought not to be heavily starched; boiled starch is best, and potato and wheat are to be avoided. For coloured table linen use only starch water. Starch glazes had much better not be used for table linen and delicate fabrics.

Fine muslins, poplins, etc., may be nicely starched with a weak (*warm*) solution of isinglass in pure water.

Flimsy ties, light silks, etc., sometimes require a little additional stiffening besides that given by the warm iron. In these instances, better not use starch, but prepare a solution of pure gum arabic in rain water; add a little of this solution to the last rinsing water.

When about to heavily-starch articles much exposed to the atmosphere, it is well to remember that, in boiling, starch is largely deprived of its moisture-absorbing qualities.

CHAPTER X.

MANGLING.

Preliminary Remarks—What to Mangle—Mangles—Preparing for Mangling—The Process of Mangling—Folding—The Working—Hot Pressing—Calendering.

MANGLING consists of a process of smoothing textile fabrics between heavy rollers, which pressure may or may not be combined with heat. Mangling is generally reserved for such articles of linen as have not to be highly finished, and have not been starched.

What to Mangle.—All household linen—tablecloths and napkins, sheets, pillow-cases, towels, counterpanes, dusters, glass-cloths, &c.; much of the body-linen—such as nightshirts, chemises, underwear, &c.—should be mangled. In many instances the table-linen and certain articles of underwear are slightly starched, when, of course, they must be ironed instead of mangled. Flannels may be mangled instead of being ironed. Rough bath and other towels, and such fabrics as have raised or rough patterns, should not be either mangled or ironed, but be dried after being carefully stretched and hung on lines, or fixed to drying frames; mangling and ironing spoils the appearance and "touch" or "feel" of all such rough materials.

Mangles.—Most of the modern mangling machines are very neat affairs, are easily managed, and do their work in so satisfactory a manner that many articles may now be safely mangled that formerly required the most careful ironing. This is the case with toilet-covers and antimacassars. The heavy rollers are made of better materials, and in some instances two rollers take the place of the old stone bed; moreover, mangle rollers are now occasionally heated internally either by steam or gas. Mangles require to be worked with care and constant attention if good results are looked for. The hasty passing through of linen is a continual source of disappointment and loss of time. The working parts must be properly oiled, and the rollers kept scrupulously clean and always free from loose fibres and threads. A damp sponge and soft linen rag will enable this to be done with care. If the mangles are thus constantly looked after, not only will they give far more satisfaction than if stupidly neglected, but will save labour and last much longer.

Preparing for Mangling.—The linen that is to be mangled ought to be brought straight away from the hydro-extractor; or in small places, where these useful machines are not used, before the linen is quite dry. Sheets, counterpanes, and towels should be mangled quite damp; table-linen and body-linen, being of finer texture, may be nearly dry before passing through. If the linen is quite dry and feels at all crisp to the touch, it must be dampened before it passes through the machine.

The Process of Mangling.—We have already pointed out that care is essential even when wringing linen; consequently it will be readily understood that care is still more necessary during mangling operations. The appearance of the linen depends altogether upon this care, and, to a great extent, so do its lasting capabilities. Undue straining in the mangle in the long run tells against the enduring qualities of linen.

Take up the damp article to be mangled, stretch it smooth, and place it with precaution between the rollers, taking care that the article is laid straight and goes through the machine selvedgewise. Smooth the article as it passes through to prevent the formation of pleats or the straining of the texture in any one particular direction.

Folding.—In folding articles to pass through the mangle, see that the edges meet, or the linen will never look well, or the texture will be strained out of its natural lines, and thus make it uneven in every direction. Table and bed linen will give much trouble unless these preliminary measures are duly attended to. In the case of body-linen, never forget to protect buttons and tapes by folds in the article, or the buttons will be broken and the tapes wrenched off—which wrenching, let us not forget, will often cause damage to the linen.

In most large laundries, even when the tablecloths and napkins are ironed, it is usual first to pass them through the mangle, as this saves trouble—provided, of course, that the articles are not heavily starched.

The Working.—If the mangle is a manual one, see that it is worked at a constant rate, and even then not too rapidly. If worked by fits and starts, now slowly, then fast, the work will be uneven, pleats will be inevitable, and the articles come out all awry.

Hot Pressing.—Hot pressing may be done with steam or gas-heated roller mangles. It is simply pressing various fabrics and garments after they have been washed or cleaned in order to smooth them and give them a finished appearance. When hot pressing with mangles, it is well to wrap the article of clothing, &c., between two pieces of linen. Use the mangle as hot and as slowly as possible.

Calendering.—We occasionally hear the word calendering used in connection with laundrywork as synonymous with mangling. As a strict matter of fact, however, calendering is a distinct operation, only used to finish off freshly-manufactured textiles, or to give the dyer's and cleaner's work a proper finish. Calenders are invariably made of two heavy metal cylinders, warmed by steam or gas. These metal cylinders are also made with uneven surfaces, that is, patterns or wavy lines are sunk in their surfaces; these patterns are transferred to the damp textiles as they pass through. The wavy lines impart the beautiful "water" marks so much admired in cheap materials.

These latter machines have nothing to do with the laundry. The so-called calenders of laundry engineering manufacturers are roller mangles, heated by gas or steam; they are admirable machines for high-class work.

CHAPTER XI.

IRONING.

The Furniture—The Tables —Ironing Boards—Stoves—Flat or Sad Irons —Convex Irons—Box Irons—Goffering Irons—Italian Irons—Ironing Machines—Preparing for Ironing—Ironing—How to prevent Blistering—Ironing Muslins, Silks, and other delicate fabrics.

The Furniture.—One of the first necessities in an ironing room is a good stove. It should be made of thick plate metal, with four sides, slanting gently inwards and in an upward direction, and be provided with projecting flanges on which irons can be rested. Many ironing stoves are so manufactured as to have a downward draw, the smoke being carried off by a flue under the flooring; this does away with the usual unsightly and inconvenient chimney, and provides greater security against the possibility of smoke and smut invading the room. Stoves should be lit with wood and coal, and kept up with coke and a little coal. The coal and coke bin should, in large establishments at all events, be fixed on wheels, thus enabling it to be taken out of the room when it has to be replenished.

The Tables.—The next articles of importance are the tables. These should be long and narrow and of firm build. It is very useful to have a shelf underneath, about a foot from the ground, where the linen to be ironed may be placed in safety and convenience. The ironing table should have a solid top, which must be free from cracks or obstructing knots. The top is covered first with flannel (old blankets do very nicely), and then with some fine old linen, which must be quite free from patches or prominent seams, and not too worn out.

These tables are used for ironing the bulk of the linen, but shirts, dresses, and collars are ironed on specially prepared boards.

Ironing Boards.—Even for the most elementary ironing at least two boards are required. Number one should be about two feet long by fourteen inches wide, and some six inches in thickness. This board may be made of any white wood, but must be strong and free from blemishes. It must be covered with flannel, not too thin, and yet not fluffy or rough, and on this an outer covering of linen must be tacked. This padding may be tacked on with flat-headed nails, provided the nails are driven well home to prevent disasters; it will be found safer, though perhaps a little more difficult, to sew on both the flannel and linen. It is necessary, however, that the padding should be quite firm so as to make forming of wrinkles an impossibility. Board number two should be some four feet in length by six in thickness, and made tapering from sixteen inches in breadth at one end to twelve at the other. This board should also be covered with flannel and linen. The first one is used for ironing shirt bosoms and suchlike articles; the second one is reserved for ironing dresses and petticoats. There are now a great diversity of patented shirt and collar ironing boards, which are very useful (being a source of economy in time and labour) in large laundries. They should also be used in private laundries where many men's and boys' shirts have to be got up.

Flat or Sad Irons.—In most large laundries flat or sad irons are preferred for ordinary use. They should not be too heavy, and should have comfortable handles. As they take some considerable time to get properly heated, three sad irons will be required for every ironer. This will prevent loss of time from waiting, or attempting to use half-heated implements. Each ironer should be provided with a holder, composed of several folds of thick flannel or cloth sewn together, somewhat after the fashion of a kettle-holder, only more substantial. Each ironer should also be provided with a stand, made of stout wire, and supported on four short legs, on which to rest the hot iron when an article has to be turned or otherwise adjusted. Two cloths per ironer will be found necessary; a coarse one on which to wipe the iron when freshly removed from the stove, and a piece of old linen to be used to smooth the article being ironed, or remove any blemish.

Convex irons of a smaller size than the ordinary sad iron are used to iron certain goods; one or two of them should always be kept.

Box Irons.—Box irons are regarded as veritable treasures by the average housewife, but laundrymen in a large way of business find them expensive. They are generally much heavier than flat irons, and require great care in use. This in itself is a serious drawback for women who have to remain at the iron-board for many weary hours together. On the other hand, they are always clean. In practical experience, however, it is found that the polished ironing plate, being so constantly heated to a high degree, soon wears out, becoming rough, and then has to be sent away to be retinned. Then, again, unless the ironer is cautious, she is apt to place the heating iron in the box at too high a temperature, when much damage is done to the linen, as it is more difficult to ascertain the heat of a box iron than that of a sad iron. If these implements are used, only one box and two heating irons per ironer will be required. But this will not make much difference in the capital outlay. Great care should be observed in seeing that the box is well secured when the red-hot iron is placed inside.

In the hands of experienced workwomen almost the same amount of finish can be produced with either kind of iron.

Goffering Irons.—The great shear-like goffering and frilling irons are still in general use. A number of sizes should be kept. It is better to heat them by inserting them in sockets provided for the purpose in the ironing stoves, or in a gas flame, than by poking them in a coal fire. Before using them, in any case, the round heated ends should be wiped, and care taken not to use them at too high a temperature, or the fabric will be scorched, especially if it is highly starched.

In large laundries, frilling, goffering, and crimping are now done by special machines. These are much safer and economise time, while ensuring better results; goffering with the old-fashioned irons is a difficult art, only to be mastered by constant practice. It is well to try "'prentice hands" on indifferent linen articles. The machines will, however, be found a source of great economy even in small establishments.

Italian Irons.—Italian irons are like box irons; they are cases heated by separate movable pieces of metal taken red-hot from a stove. The articles to be goffered are pressed rapidly on the heated end. It will be necessary to have at least two heaters for every Italian iron.

Ironing Machines.—Besides the large decoudun machine ironers—huge affairs with steam-heated, polished metal rollers—we have a great number of small special ironing machines, for ironing shirts, collars, cuffs, shirt bands, and shirt bosoms. Full details as to this mechanism will be found in Chapter XXI. We will here merely observe that these machine ironers are great savers of labour and time. They are also much safer in the hands of the inexperienced, although there are people who prefer to iron shirts, collars, and cuffs with the old sad iron.

Preparing for Ironing.—All articles must be ironed in a slightly damp condition. They may be brought straight from the preparing room, where they have been starched, and ironed at once. The usual way, however, is to starch a large quantity of linen at one time, rolling up the bosoms and cuffs of shirts inside the skirts, and twisting collars, cuffs, frills, etc., in napkins or other articles of that description. The articles when wanted for ironing are generally found to be nearly or quite dry. They then must be damped. In large establishments this is done in the preparing room. The articles are spread out on a table and the starched surface smoothed over with a wet sponge or linen pad; or, better still, they may be sprinkled by means of a little box resembling a pepper-castor or a small machine in the shape of a lemon-squeezer, a moistened sponge taking the place of the lemon. Thick textured and heavily starched goods require to be ironed very damp; delicate materials only just slightly damp. Of course this work can be done by the ironers themselves as each article is taken up, but it is far better to prepare the linen beforehand, damping it, rolling it up, and placing it in a basket ready for use. On the ironing tables, or on the shelf below the tables, a few pots of water, together with a sponge or linen rag should be kept, so that any fault can be remedied at once, or any blemish (smut, speck, or starch ridge) effaced while it is still possible.

Ironing.—The ironing of table-linen is a comparatively easy task. Each article, which should be fairly damp, must be placed on the table, and a piece smoothed with the hand; then carefully pass the iron over it rapidly, always ironing downwards or away from you. The articles should be gone through steadily, finishing one piece before another is begun; if any pleats occur or the starch curls up in ridges, stop at once and smooth down with the moistened sponge. The iron for table and body linen should always be very hot; if merely warm the task becomes a long and difficult one, the linen remaining limp, and pleats occurring frequently. Prints, and suchlike fabrics, should be ironed only slightly damp, and with a moderately hot iron; if too hot the colours would be spoilt.

How to Prevent Blistering.—Those tiresome and ugly blemishes on shirt bosoms, collars, cuffs and other two (or more) ply linen goods, called "blistering," are almost always due to bad starching, but occasionally also to ironing the articles when too wet. The starch should be of a good consistency, neither too thick nor too thin. Each article must be well starched through, and when about to iron, damp it evenly, but do not wet it. Use a hot iron, and see that it does not stick.

Collars and cuffs that have to be turned down should be fixed in the proper shape immediately after each one is ironed, for then the starch is still flexible; if the operation of turning down is delayed, the operation not only becomes difficult, but the starch, being stiff and resisting, the fibres break, so the collar or cuff presents the appearance of having been cut with a knife.

Waxing Irons.—As we have shown in Chapter IX., it is a common practice to melt wax or tallow in starch when a fine gloss is required on linen. This wax or grease certainly helps to make ironing much more easy, always providing that it has been properly incorporated with the starch in due proportion. On the Continent it is usual for ironers to apply some kind of fatty matter to the iron itself instead of mixing it with the starch. Thus we see ironers rubbing a candle-end or a piece of soap on the hot iron on removing it from the stove; the iron is then quickly wiped on a rag and operations are commenced —and assuredly with good results. We would advocate the adoption of a modified form of the above plan, which will be found specially useful to all those who are not proficient professional starchers, as it will do away with the necessity of mixing wax or tallow in the starch. Purchase a piece of paraffin wax, or cut off the end of a pure paraffin candle, and wrap the wax in several folds of muslin; tie it up. When about to iron, take hold of your wax-end in its muslin casing with one hand and the hot iron in the other; now rub carefully the wax on the smooth surface of the iron until it is completely covered with wax. Wipe the iron with a soft rag and proceed to iron the damp starched collar, shirt, or cuff. A fine gloss will be the result, and easy work besides. Do not use too much wax at a time, as it may be applied when required, and be careful to wipe off the superfluity. For ladies' maids, and others who are not always ironing, the above method will prove an immense help. In large laundries it is probable the old fashion of incorporating the lubricating substance in the starch will be found more suitable, on the score of economising time.

The Ironing of Muslins.—Muslins, whether starched or simply dipped in gum water, must be ironed very carefully. In some cases the iron should first be pressed down upon the muslin, and then lightly passed over it.

Silks and Delicate Fabrics.—Silks when ironed ought not to be too damp; in the case of vivid coloured or delicate-tinted silks, they must be almost dry. Poplins and very fine cambric ought to be ironed quite damp. The iron itself, however, should never touch any of the above fabrics. Each article must be placed between the folds of fine linen, and the iron passed over them. Where the articles are dyed with fugitive colours, even in addition to this precaution, the irons must not be too hot.

Pongee Silk.—It is generally thought that it is impossible to wash and "get up" soiled and crumpled Pongee silk; but if precautions are taken it may be done perfectly well. Only the silk must be allowed to dry thoroughly, then place it on flannel, cover with linen, and iron over it. A hot iron applied to this silk when damp causes it to shrink and change colour. Really *hot* irons applied to *wet* silks, poplins, &c., will frequently transform a beautiful pink to an ugly crimson; light greens into dirty blues; yellows into browns.

In ironing silk hose, neckerchiefs, etc., it will be wise to let *them* dry, and place over them a *slightly damp muslin* on which the iron may be passed with safety.

Preservation of Sad-Irons from Rust.—In order to make your implements last as long as possible and get the best results from their use, you must take care of them. Irons soon rust, and then practically they are spoilt—are worthless. To preserve them, smear over the hot iron some mutton fat or paraffin wax; allow a thick coating to form, it can easily be removed when the irons are wanted. Oils should not be put on irons, as they generally contain a certain amount of water. If a few specks of rust are on an iron apply some sweet olive oil, and leave it for a couple of days. Then rub over it some unslaked lime; this will generally remove rust stains, and if too much of the smooth surface has not been eaten away by the oxidation, a little paraffin wax and rubbing on a smooth surface will soon make it fit for use again. But when putting away sad-irons on a shelf or in a cupboard, always protect them with mutton fat or paraffin wax. Although this applies more especially to domestic and small laundries, the precaution may as well be observed in large ironing rooms: it can do no harm, and may prevent serious mischief.

Ironing by Machinery.—As we have already hinted, ironing by machinery is a much more simple affair than ironing by hand. Table-linen, much of the unstarched body-linen, handkerchiefs, etc., etc., are ironed by the large decoudun or other roller ironers. Some of these machines have two polished metal rollers (heated internally by steam or gas); the rollers are worked by steam or gas engines, and revolve slowly. The articles of linen are smoothed by hand while damp, and placed carefully and squarely between the rollers on one side of the machine and just helped through, to keep the article quite free from pleats and in a straight position; they are received on the opposite side on a table or board, taken up and placed to air, or immediately folded. In other machine ironers there is only one roller and a polished metal bed. The process of ironing is here the same, only more care is required in helping the linen through.

Some of the shirt ironers have a small metal plate, and above this a good-sized iron, heated by steam or gas, which is lifted up in the air or depressed upon the plate by means of a treadle and a jointed lever, and is moved backwards and forwards by a guiding handle placed on the front or just above the iron. The garment to be ironed is placed squarely on the metal plate and the iron is depressed, when it rests firmly on the linen and is moved backwards and forwards with one hand, while the other gently pulls the linen in the right direction, until the operation is terminated, when the iron is lifted up, the garment removed, and another one put in its place. These machines enable the work to be got through with astonishing rapidity and surety; and by regulating the steam supply or gas flame, a uniform and constant heat may always be obtained, while, when necessary, it may be speedily increased or lessened. The collar and cuff ironers, shirt bosom and other ironers are merely machines specially shaped for different work; the shape of the plates and smoothing irons vary in each case. They are designed with the view of saving time and trouble in guiding the iron, and also labour in lifting and pushing the heavy irons; the principle on which they are worked is much the same as in those we have described.

It will be found that much depends on the preliminary operations, for it is perfectly impossible to successfully iron a badly washed, a badly rinsed, badly blued, or badly starched article. It is essential that proper supervision should be observed all along, from the moment the linen comes into the laundry to the minute it finds its way to the ironing table. Then the ironer becomes responsible, and if the linen has really been properly dealt with the task should be easy. It will be all the more so if the work is intelligently done, and also if the various implements necessary—irons, goffers, ironing machines, etc., are taken care of. They should always be kept clean, and preserved from dust and rust. It is often attention to these small matters that commands success.

CHAPTER XII.

WASHING FLANNEL AND BLANKETS.

Shrinking Flannel—Washing Flannel—Wringing and Drying—Merino—Machine Washing—Ironing—Washing Woollen Hosiery – Shawls—Blankets—Flannelette.

Shrinking.—All flannel ought properly to be shrunk before it is cut out and made up into garments. This applies particularly to inferior cheap flannels, which are really mixtures of wool and cotton. Unfortunately, this precaution is too often neglected, and causes much worry to purchasers and laundresses. When possible, see that this preliminary shrinkage takes place. The process is quite simple. Soak your flannel for a few minutes in warm water, then rub some good laundry soap over every inch of it, dip in the water once more and knead it, or shake it up and down ; do not scrub. In the meanwhile, the water may be kept warm by the admixture of boiling water, but it must ever be remembered that boiling or hot water should never touch flannel. After the washing, let the flannel be thoroughly rinsed in warm water. Wring carefully and dry slowly ; on no account allow flannel to be dried in an over-heated drying closet or before a fire. This is the whole process of flannel shrinking.

Washing Flannel.—To wash flannels, or flannel garments, prepare a good lather in hot water ; when just warm throw in your flannel and work it up and down, backwards and forwards ;

scrubbing must be avoided, and no soap should be actually rubbed on it, as this will induce further shrinkage. Rinse in plenty of warm water, twice over if necessary. The flannel should feel soft to the touch; if hard or sticky, rinse over again. Never wash or rinse either in *hot* or *cold* water. Both hot and cold water cause the flannel to shrink very suddenly, whereby it is discoloured, by retaining soap, etc., and is made to dry more like a piece of pasteboard than anything else.

Wringing and Drying.—The wringing and drying of flannel should be carefully carried out. Hasty wringing will cause the fibres to break or shrink unequally. Where and when possible, flannel should be dried in the open air, and in a shady spot. But, in any case, it should never be subjected to quick drying or great heat.

If all these simple rules are only observed, no difficulty will be met with in washing flannels, so as to give them a good colour, and preserve the pleasant soft and elastic feeling of the garments. When we see flannels unequally shrunk, of a bad colour, and terribly hard, we may be perfectly sure that they have either been placed in boiling or cold water, rubbed with hard soap or steeped in an alkaline water, or been ignorantly baked, instead of judiciously dried. Remember these points, and you will steer clear of all trouble.

The only time when any saline matter is permissible in water for washing flannels is when the dyes prove unstable. In this case, do not use very warm water (just tepid will do), and dissolve in it a little chloride of sodium (common salt) or borax.

Merino.—Merino undergarments should be treated in exactly the same way as flannel.

Machine Washing.—It is far better to wash flannels, blankets, woollens, and merinos by hand, but where labour and time is too precious, they may be placed in washing machines, provided these do not contain any kind of beating or scrubbing apparatus. Boiling water and steam must not be used. Indeed, the same general rules as laid down for hand washing should be observed.

Ironing Flannels.—Most flannels are the better for not being ironed, but in some cases it is necessary to do so, and then many disappointments await the ironer. They cannot be ironed dry, and if ironed damp the flannels shrink and crinkle up. The proper way is to dry the flannels, and then spread them on an ironing board, cover them with a slightly damp cloth, and iron over this, pressing down heavily. The iron must not be too hot. Great care should be observed in this particular if the flannel is coloured.

If flannel is scorched, dip it in warm water at once, and rub softly. Wring, and re-dry. If the scorch is interfered with before soaking, the flannel will be spoilt.

Washing Woollen Hosiery.—A good way of washing woollen hosiery and other hand or machine knitted goods is to place them in warm water in which yellow soap has been previously dissolved and lathered. Use one pound of soap to four gallons of water; if the articles are dyed, put in a small quantity of salt or borax. Do not rub the articles, but pull them through and through the hands. Wring thoroughly, and rinse in warm water, finishing up by rinsing in cold water. If coloured, dry quickly. Rubbing soap upon knitted goods makes them hard.

Washing Woollen Shawls.—To wash woollen shawls, first prepare a cleansing liquor. This is done by stirring about half-a-pound of soap in a gallon of water. Boil this, and stir it until it becomes a weak jelly on cooling. Add a tablespoonful of paraffin, and one of spirits of hartshorn for every gallon of water. The shawls should be washed carefully in this, and then thoroughly rinsed in warm and cold water. If dyed, add a little common salt to the rinsing waters. Wring out of the water, and place the shawls between the folds of a sheet, then mangle, and, if necessary, iron with a cool iron. Bed-covers and other knitted woollens should be treated in the same way.

Washing Blankets.—Put the soiled blankets to soak for fifteen minutes in plain warm soft water; do not add soda or even borax. Now prepare a soft jelly with first-class laundry soap and boiling water; one pound of soap for every blanket is the recognised allowance. Pour this into a tub of warm water, let it melt, and lather it up well with the hand. Wring the blankets from the soaking tubs and throw them into the lather; stir them about a bit and leave to soak for some ten minutes; then hand-rub every inch of the blankets, paying special attention to stains. Take them out and wring; then rinse, in warm water first, and then in tepid. They must not be placed in cold water, or they will discolour and lose their softness. Dry well, but do not let them be exposed to great heat. When dry, stretch them in every direction, and rub all over with a piece of clean rough flannel; this makes them fluffy and soft.

Counterpanes and quilts may be treated in a like manner.

If very dirty, a little borax or hydroleine may be added to the washing liquor, but no soda or bleaching powder should ever be used with flannels or woollens, far less with blankets.

The fabric known as flannelette may be generally treated as ordinary flannel, but it is said that when liquid paraffin is used in a boiler or copper, flannelette may be boiled with other goods. Good rinsing is then absolutely necessary.

CHAPTER XIII.

CURTAIN AND LACE CLEANING AND IRONING.

Preliminary Remarks—Preparing Curtains for the Wash—Washing—Drying—Starching—Colouring Curtains—Ironing—Mending—Cleaning Lace—White Silk Lace—Ironing—How to prepare Special Colouring Starches for Curtains—Care of Curtains.

Preliminary Remarks.—Curtains of real or imitation lace, and also those of muslin, require pretty frequent and thorough cleaning, and usually the washing of such fabrics proves a severe test for most laundrywomen. Good Nottingham curtains generally sustain the ordeal of repeated "getting-up" far better than even the coarser cheap imitations, and are certainly easier to deal with than the beautiful flimsy muslins so much affected for home decoration in some quarters. But as it is the laundrywoman's duty to do her best with whatever may be sent to her, she must be prepared to deal with all kinds of curtains.

Preparing Curtains for the Wash.—Curtains of all kinds accumulate dust in astonishing quantities. It will be necessary to shake every curtain, or hang them on a line and brush them down with a soft, long-haired brush ; this will get off much of the dust and blacks. Proceed to prepare a soaking liquid by melting a small quantity of borax in warm water. They should not be allowed to soak too long (not above an hour or two) for fear of rotting the finer threads. Get rid of the superfluous water by passing them very carefully and gently through loose wringing rollers, or, better still, by squeezing between the hands. Remove immediately to the washtub.

Washing.—We do not advise anyone attempting to wash curtains by machinery: it is a dangerous experiment, even when dealing with coarse curtains. Better take a little more trouble, and give a little more time and attention, and then bring your curtains safely through the process. Take some good soap (free from alkaline excess) and chip it in hot water; stir until all the soap is melted and a fine lather produced. By this time the water will be moderately warm. Remove the curtains from the soaking-tub and immerse in the washing fluid. If the curtains are not very soiled, and have been properly "got-up" on former occasions, it will only be necessary to pass them repeatedly through the lathered water, or work them up and down. Rubbing of all kinds should be avoided; when absolutely necessary, do it gently and without a brush. Squeeze out the soapy water and rinse in plenty of soft warm water. Wring carefully and proceed to dry.

Drying.—Curtains ought to be dried quickly. There are plenty of special drying closets devised for curtains, and when possible, these should always be used, as they save bother and do the work effectively. Curtains may be dried by hanging them over wood or galvanized iron airing horses, placed at a safe distance from the fire. If in the country, and it is a clear day, they may with advantage be spread to dry on clean grass. Otherwise, curtains are always better for being stretched and pinned to wooden frames while drying.

Starching.—It is advisable to use cooked starch. Procure a good starch and mix it thoroughly in warm water, which should be made to boil for fifteen or twenty minutes. While cooling, add a very little indigo blue, prepared by melting ball blue in tepid water. This is only to be used when you wish to have pure white curtains, as the modicum of blue rectifies the slight yellow hue of the washed curtains. The starch should be decidedly thick. Take your curtains and draw them through the starch, squeeze out gently, and dry the curtains rapidly.

Colouring Curtains.—Many persons prefer tinted curtains to pure white ones. If they have to be coloured do not put any blue in the starch, but use water that has been slightly tinted with coffee (for *écru* curtains), tea (for a more decided hue), or saffron (for yellow tint), for preparing the starch. A decoction of logwood may be used instead of coffee water if you wish to give the curtains a delicate pink hue.

Ironing.—Some curtains may be safely passed through the large roller ironing machines. When ironed by hand place them, while still a little damp, on the ironing table, and spread them out carefully. Place a piece of muslin or very fine linen over them, and iron with a well-heated iron. This precaution of protecting the curtains is especially necessary when they have prominent designs connected by thin, web-like stitches. Figured muslins may be treated all along as above described; do not attempt to pass the iron rapidly over them, but press down. If an attempt is made to iron figured muslins in the ordinary way they are sure to be torn to shreds. When curtains are lined, iron from the middle towards the edges; in this way, if the lining has shrunk (a common occurrence), any pleats in the lace or muslin will be driven to the edges, where they will not be so much noticed as they would be in the middle. Muslin curtains that are pleated, and should appear with the flutings expanded, should be either starched and thin pieces of wood inserted in the flutings and the curtains rapidly dried, or they should be ironed when moist, and their pleats fluted out by passing any round instrument between the folds.

We may mention that if curtains have to be darned, or in any way mended, this should be done before they are washed, as otherwise the best work will be soon spoilt.

Cleaning Lace.—Lace that is very much soiled ought to be carefully sewn into thick white boards having plenty of holes. A better plan, however, is to sew the lace between strips of clean white flannel. Prepare a strong lather with white Castille soap in hot water, to which add a little borax (a teaspoonful to every gallon). The soiled lace should be soaked in this warm lather for some time; the flannels, or boards, being drawn backwards and forwards several times. If the lace is very dirty, change the lather once or more. Unpick the folds of flannel, squeeze out the soapy water, and rinse in warm soft water, squeezing gently between the hands.

White Silk Lace.—White silk lace soon becomes yellow, but its primitive hue may be restored. Sew the lace between folds of white flannel, and steep in a hot bath of milk and borax. Wash in the same mixture as recommended for ordinary lace; rinse, but do not rub. If the lace is still deficient in colour, bleach in the sun.

Ironing.—Lace ought only to require ironing, but if additional stiffness is required do not starch it, but dilute a little pure gum arabic in the rinsing water. Lace should be smoothed on a piece of flannel and have another piece put over it. Iron over this with a hot iron. To be successful with lace, when ironing, it should always be covered. Cuffs and frills ought to be unpicked before washing, and the lace ironed out straight. It may then be retacked to the band, and the frilling formed with the fingers. If necessary to use goffering irons, be very careful that they are not actually hot, as white lace will at once discolour on contact with heated metal.

How to Prepare Special Colouring Starches for Curtains.—It is often preferred to use special starches for getting up curtains, and although we do not advocate this plan, we feel obliged to take some notice of what many in the trade do daily, with profit to themselves and, apparently, satisfaction to their customers. The basis of these colouring "starches" is thus prepared: Soak one pound of good white glue for twelve hours, using just enough water to make it into a jelly; dissolve this with boiling water, adding about eighteen to nineteen pounds of Paris white; add more water until the compound is diluted to the consistency of milk. This starch may be coloured according to taste. A little Prussian blue and vermilion (in the proportions of two to one) gives a fine lilac. Raw umber and a pinch of lampblack gives a grey. Vermilion and red lead (in the proportion of three to one) produces a tender rose. Indigo blue just tinted with vermilion gives a lavender. Chrome yellow and a pinch of Spanish brown gives a lemon yellow. Indian yellow and burnt sienna (in the proportions of two to one) gives a buff hue. These tints may be intensified at will. But experiments should be tried, as some of the colours look very bad indeed if they are dark.

Careful housewives will take care that their curtains do not become too dirty before they are sent to the wash; they will suffer less from repeated washings than from the necessity for really scrubbing them. If properly finished with good starch —cooked is best, because it then is least apt to absorb moisture —the curtains will last very much longer.

CHAPTER XIV.

CLEANING.

Preliminary Remarks—Cloth Curtains and Decorative Hangings—Removal of Stains; grease, rust, paint, mildew, or water stains—Renovating Fabrics; merinos, cashmeres, black silks, satins, gloves, furs—Chamois Leather—Cleaning shawls, velvets, velveteens, and plush—Feathers—Dry Cleaning.

Preliminary Remarks.—Housewives and those engaged in the laundry trade have frequently to lament over stained garments and decorative hangings, which they would like to clean but hardly dare touch. Now, without in the least attempting to invade the domain of the dyer, or to go beyond one's depth, most people may easily undertake the restoration to pristine brightness of many garments and various articles, and that at a considerable saving or profit, provided they work on a few well ascertained lines.

A number of deep saucers, a strong table, a padded deal board, some small squares of flannel and soft linen rags, together with a selection of brushes (soft and hard bristles, for removing dust and adjusting the "nap"), are all the tools that are strictly necessary. The working materials consist of stale bread-crumbs, benzine collas, ammonia, borax, turpentine, alcohol, and bran. Furnished with these, any person of common intelligence, but endowed with the virtues of care and patience, may successfully blossom into a *dry cleaner.*

Cleaning Cloth Curtains and Decorative Hangings.—

Curtains, vallances, table-covers, and many other cloth articles of household furnishing often get terribly dusty, and also suffer from loss of colour. Such articles should be well brushed, and when necessary beaten, in order to expel as much dust as possible. This done, proceed by stretching the article on a strong table, and then rub the whole surface with stale bread-crumbs. The bread must be white: preferably take the crumbs from cottage loaves. Begin from the top and work downwards, taking plenty of time to rub the bread-crumbs thoroughly over every inch of the fabric. When the bread-crumbs become very grey brush them forward; take a new lot of bread-crumbs and go over the rubbed part once again; then rub lightly another strip of the cloth with the partly-soiled bread-crumbs; when done, discard them and take more crumbs. In this way every inch of the curtain or hanging is gone over twice, and the general effect when the whole operation is terminated, and the cloth well dusted, will astonish the novice.

In most cases such fabrics will require no further treatment. Stains, of course, should be removed separately; and if the colours are much faded, the curtains or other articles may be lightly rubbed with a flannel pad, dipped in watered ammonia for dark colours, or a strong solution of borax for light colours and unstable dyes of all kinds. This moist rubbing should be done lightly and rapidly, taking care not to wet the fabric, but merely damp it.

Removal of Stains.—When stains have to be removed from heavy curtains, hangings, and other cloth goods, take the precaution to dust or brush each article first. Take up the stained part and stretch it over a saucer, or if too large on a padded (blanket and linen) deal board. Have your cleaning preparation ready in a cup or saucer close at hand. Dip a piece of flannel or linen rag in the solution, and describe with it a complete circle some little distance round the stained spot;

work with the wetted rag rapidly but carefully inwards. This way of proceeding prevents the stain spreading. Do not use too much liquid; mop up the moisture; cover over the palm of the hand with flannel or linen, and rub the spot dry as soon as possible. If very wet and the fabric will not bear much rubbing, spread over the spot some clean stale bread-crumbs to absorb the moisture, brush these off, and rub lightly to finish up.

Grease Stains.—All stains on clothes, etc., whether made with fats, butters, or oils, should be removed with benzine collas. This also refers to the collars of coats, etc., that have been much worn and are stained by perspiration. Do not use the benzine too strong or lavishly. Candle-grease stains and wax may be removed with blotting paper and a hot iron. If the colour suffers a little, rub over with a weak solution of ammonia or borax.

Sugary Stains.—Sugar, syrup, and other suchlike stains should be removed with pure alcohol. If the colours are of doubtful tenacity use spirits of wine instead.

Rust Stains.—There are but few more delicate things than the removal of rust stains from coloured articles. The stained part must be laid on the back of a plate or marble slab (wood and iron must be particularly avoided in this case). Rub the stained part with some oxalic acid, but remove as quickly as possible; for although this acid does not destroy the tissues, it generally attacks dyes, whether natural or chemical.

Paint Stains.—Oil colours must be removed from cloth with a mixture, in equal proportions, of turpentine and pure alcohol; this softens hard paint and allows it to be rubbed off. If a greasy mark is left behind, treat it with benzine.

Should the paint be fresh, or in cases of varnish stains, soften with good butter instead of turpentine and alcohol. Remove the grease with benzine and a rag.

Mildew and Water Stains.—When silk or other glazy fabric is stained with mildew or water, rub the surface with a soft silk handkerchief, and then finish with some polished hard surface, such as a glass paper-weight or a heavy sad-iron. Should the stains remain refractory to these remedial measures, dip a square of flannel in pure alcohol diluted with water, and rub the stain. This must be done quickly. Then turn the silk on the wrong side, protect it with a damp cloth, and iron.

Renovating Fabrics.—Many delicate-coloured articles, such as those dyed with blues, greens, pinks, etc., when stained with any alkaline substance change their colours to a sickly yellow. The original tints may generally be restored by dipping the articles in a weak bath of tartaric acid, or, in extreme cases, a sulphuric acid bath (very weak).

Violets, deep reds, greys, blacks, and browns when stained with acids (vinegar, wine, fruit juices, etc.), should be restored with ammonia.

Merinos and Cashmeres.—There are various fabrics, such as merino, cashmere, serge, etc., which become rusty with age and exposure. Make a solution of ammonia and water, and sponge the articles well all over.

Black Silk.—The old method of reviving black silks with unsweetened gin is now almost totally abandoned for the safer French process of renovation with a weak solution of coffee water. Do not wet the silk too much, and restore the lustre by careful rubbing with a soft silk handkerchief.

White silks can be cleaned with a dry powder formed of fine starch and a little laundry blue. Rub over the tissue and dust out thoroughly. Bread crumbs or chalk should be used for pink or cream-coloured silks.

Silks may be ironed on the wrong side with a moderately hot iron, or on the right side (to give the fine lustre) if well protected by two folds of slightly damped muslin.

Satins.—Satins may be cleansed with a weak solution of borax, or benzine when greasy. Care should be observed to sponge moderately and lengthways, not across the fabric; iron on the wrong side only.

White, cream, and pink satins may be treated in the same way as cream-coloured silks.

Gloves.—Gloves that are only slightly stained should not be placed in any bath. Merely rub them over with chalk or stale bread crumbs, and remove stains with benzine; or, in preference, prepare a powder with good soap, take a piece of flannel and just damp it in warm water, then dip in the powdered soap and rub on the stains.

Gloves that are very soiled must have the stains removed before cleaning, and then be dipped in three successive baths of benzine. Press out the liquor, expand the gloves by blowing into them, and dry gently.

After use, the benzine should be put into a large glass jar, well corked; a deposit, more or less thick according to circumstances, will be formed; the clear benzine may be drawn off and used again as a first cleaning bath.

Another method of treating kid gloves is to prepare a bath with milk in which soda is dissolved. This alkaline milk is simply rubbed all over the gloves, which are then to be pressed in a soft piece of linen, blown out, and dried. The milk is said to preserve the softness of the kid. But milk ought only to be used for dressed or glazed kid.

Riding and driving gloves should be rubbed with a wet, soapy rag; then dip in a bath of water and carbonate of magnesia. Thick doeskins may be cleaned with wet pipe-clay, which, when dry, must be rubbed and brushed out.

All gloves should be stretched before they are quite dry, and then placed on a wooden hand form, the surface of the kid being carefully rubbed over with a polished bone knife.

Furs.—To restore the colour and general appearance of furs that have been exposed to dust, rain, &c., rub in carefully some *warm damp bran.* Shake out as much as possible, and absorb the moisture with dry linen. Shake the fur well, and brush carefully with a long-haired soft brush, or a pad of long-piled velvet. These operations must be carried out with the utmost gentleness, or the fur will be damaged. Do not *wet* the fur, nor dry it before a fire. Grease spots may be removed with blotting paper and a warm iron. Sugary stains must be just touched with a rag dipped in a weak solution of spirits of wine.

Cleaning Chamois Leathers.—Chamois leathers frequently find their way to the steam laundry or cleaners. They are now much worn, either as under-vests or as backs to waistcoats, their softness and warmth being great recommendations. Of course, in cleaning, the one important thing is to preserve this softness and warmth. Prepare a bath with warm water and borax (soda will often cause the leather to shrink up), rub the leather with soft soap, or a jelly made with ordinary laundry soap and a little hot water. This done, place the soaped leather in the bath and allow it to soak for a couple of hours, then rub it well. Rinse in warm water containing a little dissolved borax. The rinsing should be thorough but not too prolonged; place it in a thick towel and wring all the water out by twisting the towel; dry rapidly, but not immediately before a fire. When dry, pull the leather in all directions and soften it out with the hand or a velvet pad.

Cleaning Shawls.—White woollen shawls will not always stand washing successfully. A safe way to clean such an article is to brush all the dust out and then spread it on a table, then sprinkle over it a quantity of finely-ground white starch (rice or potato, not wheat); fold up the shawls into a square, powdering liberally between each fold. The shawl should be put away for several hours, and then be opened and dusted. The starch will have absorbed all the grease that may have been present and collected the dust. If such shawls are very dirty they may be pressed between two damp blankets before the starch is put on. Grey and light-blue woollen shawls may be treated in the same way, only using slightly blued starch instead of the pure white starch. Of course the shawls must be well shaken to get rid of all the powder.

Velvets, Velveteens, and Plush.—Silk and cotton velvets, velveteens, and plush, when stained or generally soiled through wear and exposure, may be either cleaned or dyed. Slightly soiled fabrics should be brushed to get rid of dust, and then be sponged with a weak solution of borax or benzine. When very much soiled they will have to be dipped in a bath of benzine, weakened by the addition of a little water. The drying should not be too rapid, but thorough. The pile must be brushed quickly the right way. But previous to brushing the pile the back of the fabric must be stiffened. Prepare a strong solution of gum arabic in warm water. On taking the velvet or plush out of the last bath dry it, and then brush the back all over with the gum. This stiffens the fabric and prevents the pile getting loose. When dry, turn over the velvet on the right side and brush it smartly so that the pile lies upright and in the proper direction. If this precaution of stiffening the back with gum water is not observed the brushing will only do harm, as it will drag out the pile, making the fabric look very shabby. This is particularly the case with cheap half silk and half cotton velvets and velveteens, or all-cotton goods. If not stiffened, the pile drags out and gives the texture a peculiar appearance by reason of the greyish threads which will lie loosely on the surface. If stiffened, the pile remains firm and can be easily brushed up. This stiffening will also cause the velvets, etc., to wear much longer and better. Short-haired velvets should have the pile upright, only just inclining selvedgewise. Long pile is not meant to stand upright, so it may be brushed carefully in the right direction. But the back must be stiffened all the same, to prevent the pile being dragged out of its proper place. In the case of figured and parti-coloured velvets and velveteens this precaution should never be omitted, or the design will be completely spoilt. Velvet dress trimmings that are faded and greasy may be made to appear like new material by judiciously following the above directions.

Cleaning Feathers.—Soiled white feathers, and coloured feathers that have to be re-dipped, are cleaned by washing in a bath of warm water, in which some good curd soap and yellow Marseilles soap has been lathered. This process should be repeated twice over, the feathers being then rinsed in tepid water. Coloured feathers that are merely soiled and do not require re-dyeing should be washed in a cold lather.

Dressing and Curling Feathers.—After the feathers have been duly cleaned or re-dyed they must be subjected to a special dressing process, in order to make the feathers moderately stiff. Make a strong solution of cold potato starch, and pass your feathers several times through this bath. Prepare some dry powdered starch with a little good laundry blue; smother the feathers in this; then dry them. Place the feathers on a warm plate and brush out the starch. This applies to white and blue feathers, also black; other coloured feathers should be dressed with rice or tapioca starch, and the dry powdered starch should not have any admixture of blue.

When about to curl the feathers spread them out on a warm plate and brush out. Curl with an ordinary curling knife. Holding the feather in the left hand, place the thumb over the front of the feather and the curling iron behind; press the feather on the knife, and by a dexterous slow twist curl the feather in a regular and equal cylindrical form all the way up. The knack of curling is soon learnt; do not press too heavily, and use a warm curling iron. Very stiff feathers (white or grey) may be occasionally held over a jet of steam, which will materially facilitate the operation.

Dyeing Feathers.—With the help of Judson's dyes, the housewife and laundryman can easily re-dye coloured feathers. Before dipping, feathers must be thoroughly washed in, at least, two hot baths of soap and water, a little soda or borax being added to remove all grease. It is essential that all grease should be removed or the dye will appear in uneven patches of dark and light tints. Virgin feathers must be treated for about thirty minutes in a bath of soda and warm water. When feathers have to be dyed black they must be placed to soak for twelve hours in a solution of pernitrate of iron (ten ounces of the salt to the gallon of water). A good black dye is made with a quarter pound of unraised logwood and two ounces of fustic per gallon of water. This solution should be heated and the feathers boiled in the water for five minutes, place the heated bath and feathers aside for three hours; then add a little more dye-stuff, and boil for another five minutes. This will give a very deep black; for a blueish black, only use about half the above quantity of fustic.

Judson's dyes are diluted in warm water, and the feathers put to boil in the bath for from ten to thirty minutes, allowing them to remain in the bath till cool (for about two hours). The quantity of water to be added must be regulated according to the colour desired. When dyed, proceed to dress and curl the feathers in the way already described.

Dry Cleaning.—The term "dry cleaning" is altogether a misleading one, for in reality the garments are actually dipped in benzine baths. To carry out "dry cleaning" on a large scale it will be necessary to have (*a*) a strong table with a zinc-covered top; (*b*) at least three zinc-lined pails; and (*c*) a hydro-extractor. This last machine is, of course, to be found in nine out of ten laundries. It will serve for the two departments.

Before cleaning, all garments must be beaten and brushed. Then all the prominent stains should be removed on the zinc-covered table, following the directions already given. The articles are then to be dipped and kneaded by hand in three successive benzine baths, taking care to squeeze out all the benzine of one bath before dipping in the next. The last bath is a rinsing bath, so the garments on being removed must be thoroughly wrung and placed in the hydro-extractor, in order to deprive them of all the benzine. Dry the goods in the open air or a drying closet.

The garments have now to be hot-pressed either with an ironing machine or heavy sad-irons well heated. If any stains still remain they are of a starchy or sugary nature, and will be easily removed with a little spirits of wine.

In adopting this plan of "dry cleaning" it is quite unnecessary to unpick made-up garments. Only, the hot pressing will have to be carried out with special care when garments are not unpicked.

The benzine in the three zinc pails should be turned into one, well covered, and allowed to stand still; after about five or six hours, the liquor may be drawn off the thick deposit, and may be used again as a first bath. A considerable saving will thus be effected.

In drying goods treated by this process, especially all-wool cloth, it will be necessary to stretch the garments and fasten them down on frames to prevent shrinking. Some of the plain wood and bronze trousers-stretchers will be found very useful in this connection, and will also save much trouble if employed in the laundry when flannel boating or cricketing trousers are washed.

PART II.

BUILDINGS, MACHINERY, ETC.

CHAPTER XV.

THE LAUNDRY BUILDINGS.

Model Laundries—Receiving Room—Disinfecting House—Main Washhouse—Drying Room—Preparing Room—Ironing Room—Packing Room—Small Laundries—Shafting and Belting—Care of Belting—Ventilation—Blackman Air Propeller—Crossley Air Propeller—Aland Air Propeller—"Champion" Air Propeller—General Remarks.

Good light, and plenty of it, is one of the essentials for the performance of creditable laundry work. In planning the building of a new laundry, or in the adaptation of an outbuilding or room for laundry work in connection with an hotel or private residence, this point ought ever to be held in mind. The better to attain the full benefit of light for many hours, whenever possible, the washhouse and ironing rooms should be partly lit by sky-lights. A laundry in a back-yard closed in by high walls, or in a basement, is decidedly in the wrong place; no satisfactory work could be expected to come out of such a place.

Model Laundries.—Another great point is to have all, or as much as possible, of the work done on the ground floor; this saves trouble, time, and enables a better supply of light to be distributed in each room. The walls should be built with properly fired bricks, upon a reasonable foundation; the flooring, which ought to be about a foot or a foot and a half from the ground, should consist of Yorkshire flagstones, or good concrete covered with cement. The laundry buildings must be well guarded against dampness, so thorough drainage and good flooring are necessary. In a damp building, or one where the drainage is defective, everything soon grows musty or mildewed; far more time and labour must be given to keep the machinery, irons, etc., in a fit condition; and even then, the machinery and goods generally wear out long before their proper time.

A well-planned laundry building should consist of four principal rooms, and from three to six smaller ones. The plan No. 1 (Fig. 3) represents an excellent type of building. Approaching it from the front, we see it has a ground and first floor, but the first floor only extends over the lobby and rooms C and I. The rest of the building is merely a ground floor; the long main building should have a high pitch (from 16 to 20 feet), and be lighted by means of sky-lights in the roof, as well as windows in the walls. Entering by the lobby A (which ought to be of good width), we see in front of us a small room, with wood frames and glass by way of partition walls; it is fitted up as an office, with desks, tables, pigeon-holes, etc., and here the clerks and manager sit, having an uninterrupted view of what is going on in the lobby, receiving-room, main wash-house, ironing-room, and packing-room. Passing out again into the lobby, we turn to our left into room C, which is

The Receiving Room.—This room should be provided with a few cupboards, one or two tables and chairs, and also with several wood or wickerwork receptacles mounted on wheels. The soiled linen is brought into the receiving-room from the carts, and here the bundles or hampers are unpacked,

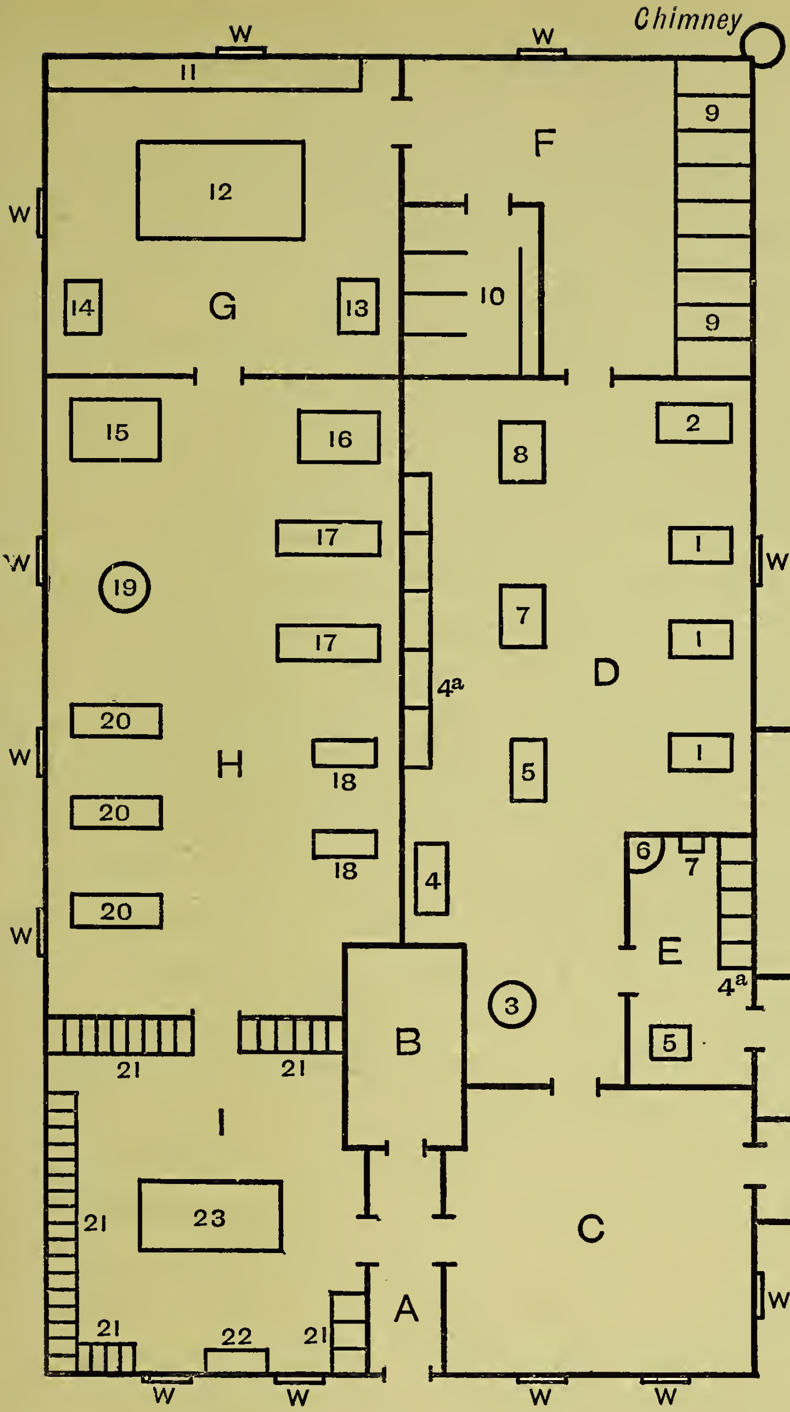


FIG. 3.—GROUND PLAN OF MODEL LAUNDRY—No. 1.

EXPLANATION.

A, entrance hall; B, office; C, receiving and marking room; D, main wash-house; E, private wash-house; F, drying-room; G, preparing and dry-cleaning room; H, ironing-room; I, packing-room; K *K*, disinfecting house; L, engine and boiler house; Nos. 1, washing machines; 2, rinsing machine; 3, hydro-extractor; 4, soaking tank; 4A, hand-washing troughs; 5, wringers; 6, boiler; 7, blueing machines; 8, starcher; 9, drying closets; 10, curtain-drying room; 11, dresser for dry cleaning, &c.; 12, table; 13, starcher; 14, hot presser; 15, box mangle; 16, roller mangle; 17, decoudun ironers; 18, shirt ironers; 19, ironing stove; 20, ironing tables; 21, shelves and bins; 22, dresser; 23, table; W, windows; 24, disinfecting apparatus.

the linen being counted and checked with the accompanying list, and the various items entered into a book. This entering of goods, however, is generally done in the office after the checking. The linen is then passed on to the markers, who sit beside the tables. If the linen belongs to a new customer a special mark will have to be assigned (see Chapter I.), which is stamped on the list in the office wash-book in front of the person's name; every item of linen will have to be marked, table, household, and body-linen, with coloured cottons, collars and cuffs with marking ink. As each item is duly marked it is thrown by the workwoman into one or other of the small wood or basket trucks, which are reserved respectively for table, household, body-linen, etc. This sorting operation should be gone through with the linen of old customers, the sorters being careful to see that each item is marked, and, if not, remedy any deficiency. The linen will now be wheeled away.

The Disinfecting House.—It will be observed that the disinfecting-house (K *K*) has a separate outside entrance. Any linen known to be infected, or of doubtful origin, ought to be brought direct from the carts by this entrance into K; the bundles should then be undone and the linen placed in the disinfecting apparatus or chemical bath (24). When properly disinfected, the linen is withdrawn into the second room (*K*) of the outhouse, and is then brought back into the room C to be counted and sorted. When the linen is considered safe, it is first counted and sorted and then passed into the disinfecting-house to undergo a more or less perfunctory treatment.

Supposing the linen to have now been duly counted, sorted, and disinfected, it finds its way finally into the

Main Wash-house (room D), either direct from the receiving-room or through room E. The linen is now taken out of the trucks and put to soak either in the tank (4) or in the hand washing-troughs (4*a*). The ordinary stains on the goods must be removed before the soaking takes place. Ladies' linen is, as a rule, treated apart in the Private Wash-house (E), which is fitted with a boiler (6), hand washing-troughs (4*a*), wringer and rinser (5), and a blueing machine. When the linen has been soaked it is taken to the washing-machines (1, 1, 1); from them it passes to the wringer (5); on to the dash-wheel rinsers (2); then back to the wringer; and, after passing through the hydro-extractor (3), it is either placed in the blueing machine (7), or taken out into the drying-room.

The main wash-house is principally lighted from the roof. The walls must be smooth and plastered over with a greyish-tinted composition that will bear washing. The flooring ought to be of hard flagstones, or, better still, of concrete and cement. The flooring should have a gentle incline from the four walls towards the centre of the room, where a drain, covered over with an iron grating, should be placed to carry off the water. This will allow of the room being regularly flushed out with plenty of water, and yet keep the room dry.

Each of the washing-machines should be supplied with service-pipes for steam, hot and cold water: the other machines and troughs merely require separate services of hot and cold water. The power gearing coming from the engine-house (L) must be so arranged as to be as much out of the way of the working people as possible.

The great difficulty is to keep the main wash-house fairly cool and free from steam. This is done by erecting an air-propeller or ventilating-fan at either end of the building. It is worked by means of a band connected with the steam-gearing. If a large-sized fan is properly placed it can be made to ventilate the whole building. But, when found necessary, a small fan may be set up in the wall of the main wash-house itself. A thoroughly-ventilated building will give greater comfort to the men and women, and enable them to turn out good work.

The Drying Room.—On the right-hand side of the drying room (F) we see the hot-air drying closets (9). These are heated partly by means of the waste gases from the engine-house, and partly by steam. The smoke-flues from the engine furnace, copper fires, &c., are conveyed underground to the chimney at the right-hand corner of the drying closet. A tall chimney with a good draught will be necessary; but in this way much heat that would otherwise be wasted can be utilised to raise the temperature of the drying room. When necessary, the heat may be greatly increased by turning on a cock and allowing steam to rush into the coils fitted into the base of the drying closets. In most cases the top of the drying closets is arranged as a platform, for the drying of blankets, flannels, &c.

Drying is not always done by hot air; a plentiful current of cool air is also frequently used, when fans, etc. are employed instead of steam coils.

In the left-hand corner of the room is the curtain-drying chamber (10). This is nearly always heated by steam, conveyed in pipes. The chamber is built of galvanized iron, and is provided with a door having thick glass panes. Round the base of the partitions run the steam coils, the flow of steam being regulated from the outside by a stop-cock. The interior is fitted with four or more suspended, adjustable curtain frames, which are raised and lowered by means of pulleys, running in metal grooves fixed to the roof.

When dried the goods are either returned to the main wash-house to be blued and starched, or at once taken to room G,

The Preparing Room.—This room should be well lighted. It is furnished with a long dresser (11), having drawers and an under-shelf, a table, hot presses, and occasionally starching and blueing machines. It is here that the dry-cleaning is usually carried on, the dresser and substantial table coming in usefully for the various processes. If much dry-cleaning is done, the three small zinc tanks or pails can be placed against the wall, and a little gas stove, or steam coil heating apparatus, be fitted in one corner. A cupboard will also be an advantage.

The blueing, starching, and sprinkling of starched linen is generally done in the preparing room, after which the linen is removed to

The Ironing Room.—Room **H**, where all the mangling and ironing is done, must also be thoroughly well-lighted and ventilated, as ironing is an extremely arduous task and very exhausting to the work-girls. In plan No. 1 (Fig. 3), the ironing room is lighted by three windows and a sky-light. The middle of this long room should be kept clear all the way down. Against the inner wall are placed the mangle, decoudun, and smaller ironing machines. A box-mangle occupies one corner of the room. Then we come to a closed iron stove for heating irons. This stove ought to be one of those specially designed for heating irons, and it will be all the better if the flue is conveyed under the flooring, either to the drying room and so into the tall chimney, or to a smaller separate chimney.

Three or four tables (20) should be placed near the outer wall, where they will get most light, for hand-ironing. A cupboard or a set of shelves will be found necessary for putting away the hand-irons and other articles.

A few wood or galvanised metal drying horses should be placed round the stove, on which the ironed linen may be "aired" off, and finally stiffened by the heat radiating from the stove.

When once the goods are ironed and aired, they must be folded and passed on to the last room (I).

The Packing Room.—This last room is lighted by two windows. Between them can be placed a dresser with drawers and shelves. As much of the wall space as is available should be fitted with long shelves, divided by perpendicular boards into bins of varying sizes. In the middle of the room should be a large table.

The washing-list having been brought in from the office, the ironed and finished articles are selected by their marks and duly counted. They must then be neatly packed in thin whity-brown paper, or placed in the bins, respectively marked for each customer, ready for packing in hampers and delivery.

Needles and thread ought to be kept in a drawer in this room, as often some slight repair is absolutely necessary before the articles can be sent out. The extent to which repairing is carried on differs greatly according to the rules and customs of each laundry. In some, missing buttons are always replaced, and a few stitches put in when necessary; in other establishments, no such work is ever done.

We now have to explain the distribution of the floor above the receiving and packing rooms. This space is generally devoted to a large store-room (for the stocking of soap, blue, starch, benzine, disinfectants, etc., etc.), a small kitchen, and a refectory.

The refectory is meant for all the work-people, who come here for their dinner and their evening tea. This refectory, even in large towns, where it is not absolutely necessary, is a great convenience, both to the workers and their masters. A charwoman generally attends to the fire and the kitchen, and supplies hot water; she will also cook anything that may be brought to her by the men and women. Of course the catering arrangements differ greatly; but, as a rule, the establishment supplies utensils and hot water (very often tea *ad lib.*), and the hands cater for themselves. These are details which every proprietor or manager must decide upon for himself.

A substantial water-tank should be supplied for the softening of water. This tank may be built with bricks and cement, or be made of iron. It is well to place it under one of the washhouses or the engine-house. In country districts another tank should be provided for the collection of rain-water off the whole extent of roofing. A small filtering nozzle fixed to the inlet pipe will suffice to cleanse the water.

It is a decided advantage if the coal-house and carpet-beating shed are built some little distance from the main building. The stables should also be as far removed as possible. For the same reasons the engine-house has no immediate door or window communication with the wash-house.

In Fig. 4 we have another laundry establishment planned entirely on the ground floor. The distribution of rooms is much the same as in the preceding plan. In this instance, however, we have separate cleaning and preparing-rooms; and the refectory, while being closer to the work-people, is always under the supervision of those in the office. The carpet-beating chamber is placed between the disinfecting chamber and the engine-house, so that one engine and boiler should suffice to work the whole establishment. The central rooms are entirely, and the main wash-house and ironing-room are partly, lighted from the roof.

Small Laundries.—The foregoing plans are for first-class and extensive undertakings; they may be modified according to circumstances, by dispensing with certain rooms and combining two or more departments into one. But whatever the size of the laundry may be, in order to turn out satisfactory work, it will be necessary to have at least three rooms. The first one, reserved for sorting, marking, and perhaps soaking the linen, need not be a very large room; the second room must be devoted to washing, rinsing, blueing, and drying. The washing and other power-driven machines should be placed as near the engine as possible, while the soaking tanks, hand-washing troughs, wringers, &c., may be at the opposite side, and the drying closet (the wardrobe or chest of drawers pattern)

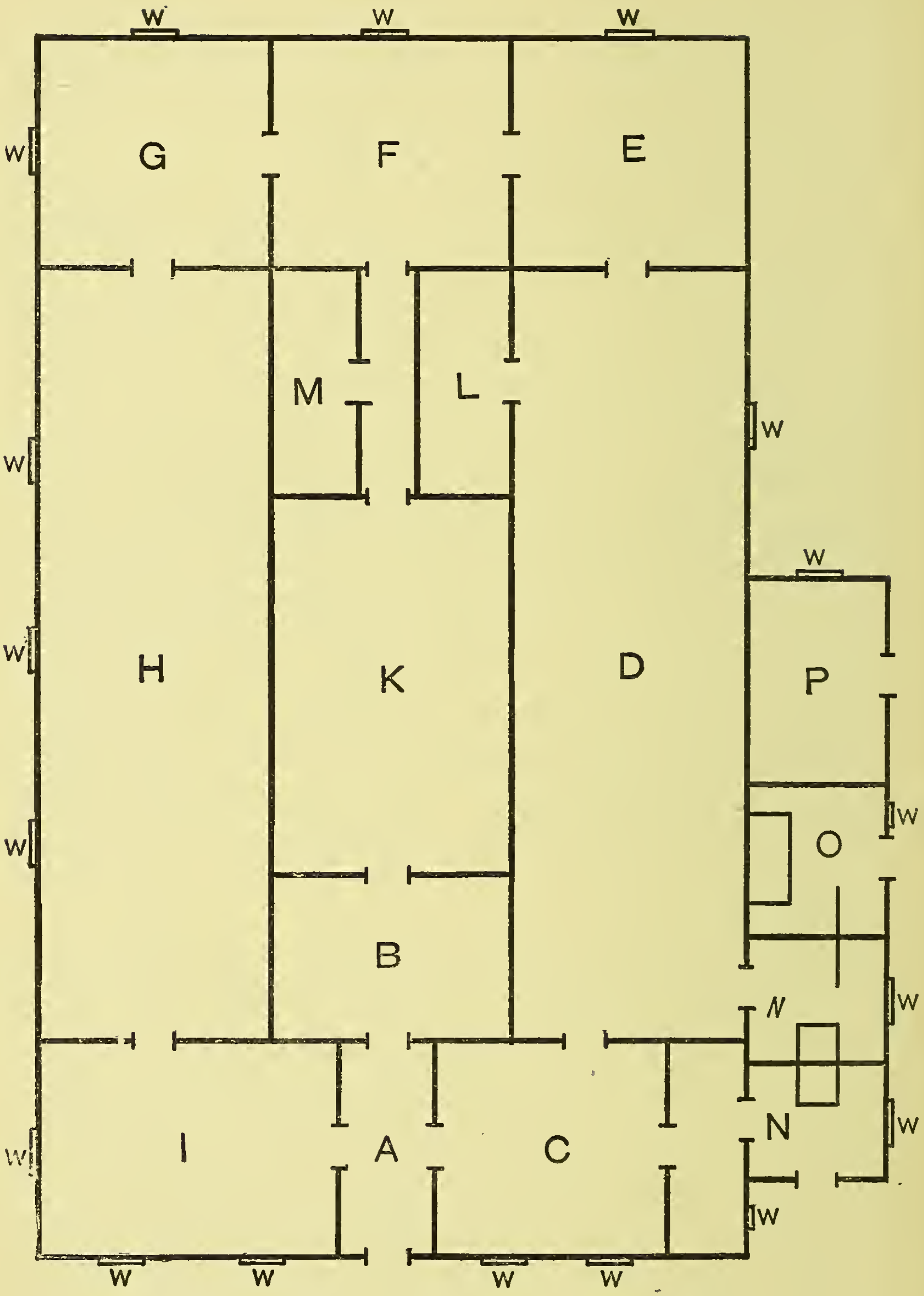


FIG. 4.—GROUND PLAN OF MODEL LAUNDRY—NO. 2.

EXPLANATION.

A, entrance hall; B, office; C, receiving and marking rooms; D, main wash-house; E, drying-room; F, cleaning-room; G, starching and preparing room; H, ironing-room; I, packing-room; K, refectory; L, private wash-house; M, store-room; N *N*, disinfecting house; O, carpet-beating house; P, engine-boiler house; and W, windows.

can occupy one end of the room. The third room must be reserved for the starching, ironing, and folding of the linen. For such an establishment as this, a small engine will supply sufficient steam power, or the machines may be worked by a gas engine, and the ironing rollers, etc., heated with gas and air.

Even in these small laundries—suitable for hotel, school, and private family work—much care will have to be bestowed on the ventilating arrangements. Where possible, it will be found far better to erect a small brick-house away from the main buildings for the installation of the laundry. On no account must it be relegated to badly lighted and drained basements: where a lift is kept it would be far better to place the laundry at the top of the house, under the roof, where the noise, etc., would not interfere with the rest of the establishment. Of course, this is only suggested for adoption in those cases where it is impossible to set aside a few good rooms on the ground floor, or to build a separate outhouse.

Shafting and Belts.—The motive power which is to drive the various machines in each department is transmitted from the engine by means of shafting, consisting of strong revolving iron bars, held in their places by metal supports. The shafting is usually arranged in a *lying* (horizontal) position against the walls and roofing. The shafting may be jointed, so as to allow the motive power to be utilised in any direction.

On the shafting, immediately above each machine to be set in motion, is tightly fixed a strong metal drum (pulley), over which a leather or other endless belt is passed; the belt is then placed on a similar drum fixed to the side or the tie-bar, or side gearing of the engine. Heavy machines are usually worked with two belts, one of which has a twist in it. The belt must be strong and should be properly adjusted, being neither too loose nor too tight. In some cases machines are driven by chains instead of belts, when the drums on the shafting and machines are substituted for cog-wheels. Machines may also be driven directly by the cog-wheel fixed to the shafting.

The pulleys attached to the machines are generally complex, that is, there are two pulleys fixed close together on the shaft, the belt, chain, or cord, being slipped on to one or the other by a forked iron belt guard. The *fast pulley* is a wheel with a grooved or flat surface for the reception of the belt or chain, and is firmly fixed to the shaft, thus when revolving necessarily transmitting motion. The *loose pulley* which lies next to, and on the outside of, the fast pulley, runs free on the shaft, and when the belt is slipped from the *fast* on to the *loose pulley*, the motive power from the main shafting is no longer transmitted to the machine, which consequently stops working.

Care of Belting.—Belts ought to be fixed on the pulleys or drums so that they slide round with ease, but are unable to slip off. They will require to be lubricated occasionally, and this should be done when the machinery is stopped, using a mixture of tallow and train oil for the purpose. Resinous substances are sometimes used, but this is a grave error, as they dry up the leather and make it brittle; most vegetable oils and fats have the same effect. The belts should not be too lavishly oiled, or dropping of grease will follow. If necessary to lubricate while the machinery is in motion, dip a rag in your lubricating mixture (at a temperature of between 112° to 122°) and smear over the outside of the belt as it passes round slowly. It is advisable to thoroughly wash the belts with warm water and a brush (say, once a fortnight) to get rid of accumulated dust. After this treatment they should be wiped dry and carefully lubricated.

Belts may be stitched or fastened together with metal studs. If the studs are of a reasonable size, and do not interfere with the free running over the pulleys, the latter is the better plan, as it greatly lessens the chance of sudden bursting asunder of a belt. Forked guards in iron are now fitted on to most pulleys and drums to prevent the belt slipping off; in some instances flat circular brass or copper studs are affixed to the belt at intervals; the idea being that the studs *bite* the pulleys and prevent the possibility of slipping. A metal "web" belt has been introduced in America, which is said to be very strong and elastic, and possessing a great resisting and wearing power.

Ventilation.—The efficient ventilation of the whole laundry buildings is a necessity. By efficient ventilation we mean some system which will free the rooms from steam and foul air, and at the same time introduce a constant stream of fresh air. This fresh air may be filtered to deprive it of humidity, dust, etc., or may be either heated or cooled before entering the room. The most approved modern inventions for ventilating are the fans. These fans consist of a number of metal blades, generally twisted after the fashion of a screw propeller, fixed to a shaft, which is revolved by means of a drum and driving belt.

The Blackman Air Propeller.—This patent ventilator (Fig. 5) consists of eight curved metal blades, somewhat resembling the scoops used for dredging purposes. The narrow ends of the blades are fixed to a circular drum fitting on to a shaft; the broad ends terminating in a curved and flattened edge, fit into a groove in a circular metal frame. The whole is strengthened by arched bars screwed to the circular frame and the central bar; these bars also prevent the driving belt from slipping. The frame containing the fan propellers is fixed into a hole in the wall or roof. A belt is placed over the pulley and the fan is made to revolve, drawing out foul air, smoke, steam, and dust, and sending in a stream of cold air. The Blackman air propeller is made in many sizes, and is often used both as a means of ventilating and drying.

Crossley Air Propeller.—The Crossley air propeller (Fig. 6) is another patented fan much in favour for ventilating laundries, and also as a means of quick drying. It is extremely simple, consisting of two large curved blades, capable of moving large volumes of air, and requiring but little driving power. It is fitted with a patented device for automatically closing the open spaces of the fan, when it is at rest, to prevent the ingress of cold air or rain.

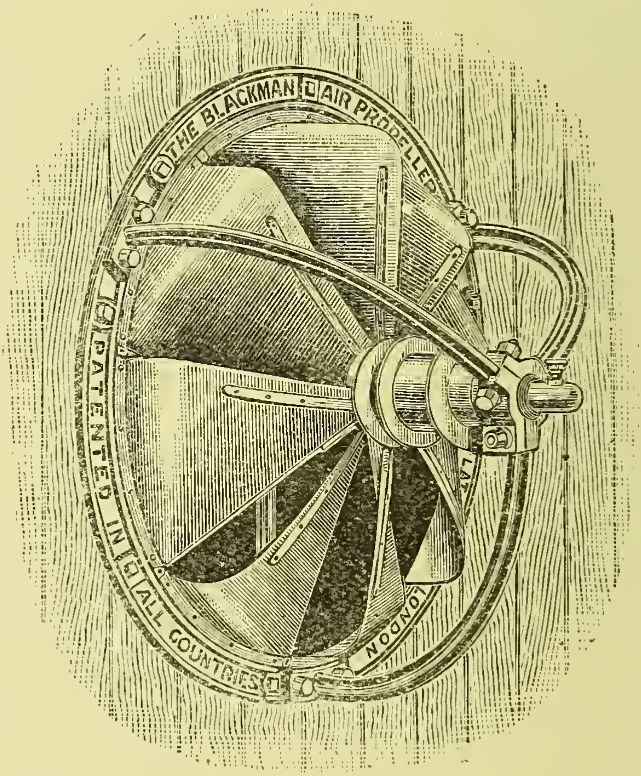


FIG. 5.—BLACKMAN AIR PROPELLER.

Aland's Air Propeller.—Aland's patent fan is composed of six square blades, slightly curved, and fixed to a metal tube, fitting on the shaft in an oblique direction. The outer edges of the blades are free. Six iron arms, three on each side, attached to the shaft are firmly rivetted to a circular frame, which is fixed in a hole made in the wall, partition, or roof.

The fan is driven by a belt passing over a drum. These fans are also fitted inside patented injectors. The injectors are hollow metal vessels, not unlike a large flattened nautilus shell. There is a tube in front and one at the side; the fan is fitted inside and worked by a belt. Aland's injectors may be utilised for exhausting or blowing, and may be worked by hand or power. Moreover, by an ingenious arrangement of hot-air or steam pipes inside the injector, or round the inlet and outlet, the air introduced may be warmed to any degree the circumstances may require.

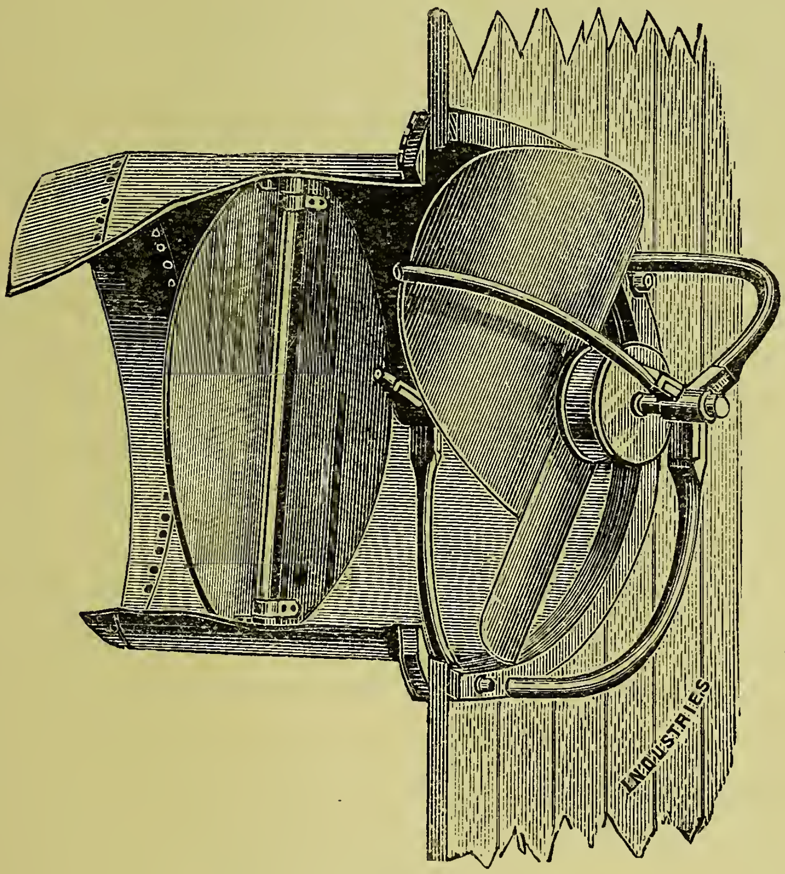


Fig. 6.—Crossley Air Propeller.

The "Champion" Air Propeller.—Howorth's patent fan is formed with six circular steel blades, of the screw propeller shape, slightly curved, and strengthened at the centre with a cast-iron boss fitting to the shaft; the blades are fitted into the boss by means of metal bands rivetted to them. The ends of the blades are free. The whole is set in a double-circular frame by means of six straight arms attached to the shaft and rivetted to the frame. They are placed in a hole in any wall, and are made in sizes varying from 6 to 30 feet in diameter, extracting respectively from 45,000 to 450,000 feet of air per minute.

Howorth's revolving Archimedean screw ventilators are well-known, and will be found serviceable in small laundries, or for ventilating separate rooms. The Archimedean screw is fitted in a revolving hood, the hood being provided with side vanes for letting out the foul air and preventing the admission of rain or snow. The screw is worked by the hood revolving, which motion is obtained by means of the outside air pushing against curved vanes placed at the top. There is an internal arrangement for self-lubrication; the little machine can be fixed on a roof or to a wall. The Archimedean screw expelling such a quantity of air, it is necessary to provide for an inlet of fresh air by means of ordinary trap ventilators, which may be built into the walls, as low down towards the floor as possible.

General Remarks.—There are other ways of ventilating (by means of rotary blowers and air compressers, for instance), but for our purpose the fan system seems to be decidedly the best. Besides the representative type of fans described in these pages, there are about a score more competing for public approval. The great thing is, get a fan that will do the utmost work with the least expenditure of motive power. In large laundries the fans will have to be worked by driving belts connected with pulleys on the main shafting, and of course the economy of motive power is an important consideration. Fans with curved blades fixed to the shafting at a moderate angle will generally do double work, exhausting the foul air and steam and injecting a current of fresh air. This may be attained simply by the shape of the blades, or by a dual motion of the fan blades, a combined screw and centrifugal action.

All these fans are easily managed, are soon fitted in any position where most convenient, and require but little attention to keep them in fairly proper working order. The "Blackman" and "Aland" fans will carry away many tons of dust in the course of a few months from a carpet-beating machine, and be none the worse for this severe work.

CHAPTER XVI.

WASHING MACHINES, HAND-POWER AND AUTOMATIC.

Manual Washing Machines—Upright Barrels and Dollies—Harper Twelvetrees' Machines with Dolly Action—Rotary Machines—Eccentric Motion—Watertight Doors—Dash-wheel Washers—Rapid Oscillating Machines—The "Invincible"—Steam—Automatic; Steam and Water—Harmen's Patent—The "Paragon"—Hughes's Patent Fountain Washers—Concluding Remarks.

Manual Washing Machines.—There are now in the market a very large number of washing machines, differing greatly in construction and system of working. Among the earliest types are the manuals. Although manuals do not save so much in time and cost as the steam-driven machines, they are a decided improvement on the old-fashioned methods of the tub of dirty water and hard scrubbing brushes of bygone days. Washing by machinery, even of the most elementary description, substantially shortens the operations and allows of their being thoroughly carried out, while reducing the actual labour.

Upright Barrels and Dollies.—One type still in use, representing the first attempt at manufacturing machine washers, consists of an upright barrel, either standing immediately on the floor on its own base, or resting on three strong but low iron feet. At the lower end is a bung-hole provided with a wooden plug, or a metal tap, for letting out dirty water. The top is partially covered over. On either side of the barrel rises an iron standard, supporting an overarching tie-bar fitted in the middle with a metal cap for securing a movable *dolly* in its place. The dolly itself differs in construction according to the machine in which it is used and the maker; in its most simple form, it consists of a substantial piece of round wood fitted at the top with a metal cogged cap and a point, and at the bottom with another metal point; about three-fourths from the top two flat pieces of wood are run through the dolly at right angles, thus making four prominent arms which are to act as beaters. The dolly is fitted into the overhead cap and a metal groove at the bottom of the washing tub. When in its proper place the cogged cap fits into a cogwheel, supported by the overarching tie-bar, and connected with a driving-wheel attached to one of the side supports. This driving-wheel is fitted with a convenient handle, and when worked round and round causes the dolly to revolve, the beaters then produce a commotion in the water, besides actually beating and rubbing the clothes.

Harper Twelvetrees' Washing Machines, with Dolly Action.—The original type of the dolly machine was one in which the dolly was attached to a false bottom, the whole working in a vertical tub, and the motion was in one direction only, the machine being known as the Home Washer. This form of machine is still used, but chiefly for collars and cuffs, by manufacturers and shirt and collar dressers.

The Villa Washer, at present manufactured by Harper Twelvetrees, is an improvement on this machine, the dolly being shaped differently, and fitted with a brass pivot working in a socket of the same metal fixed in the bottom of the tub. This machine, as shown in the illustration (Fig. 7), has a strong wooden tub, supported on a cast-iron stand fitted with wheels, and the bottom of the tub is sloped so that all the water may be readily run off. The dolly has a reversing action, moving two-thirds of a circle in each direction. This prevents the articles from becoming entangled or "roped" together, and the reciprocatory movement is also a great advantage. The dolly may be removed, and the tub is readily cleansed. The gearing is supported by two side castings, and the reversing action is extremely simple, consisting of a rack running in a cast-iron

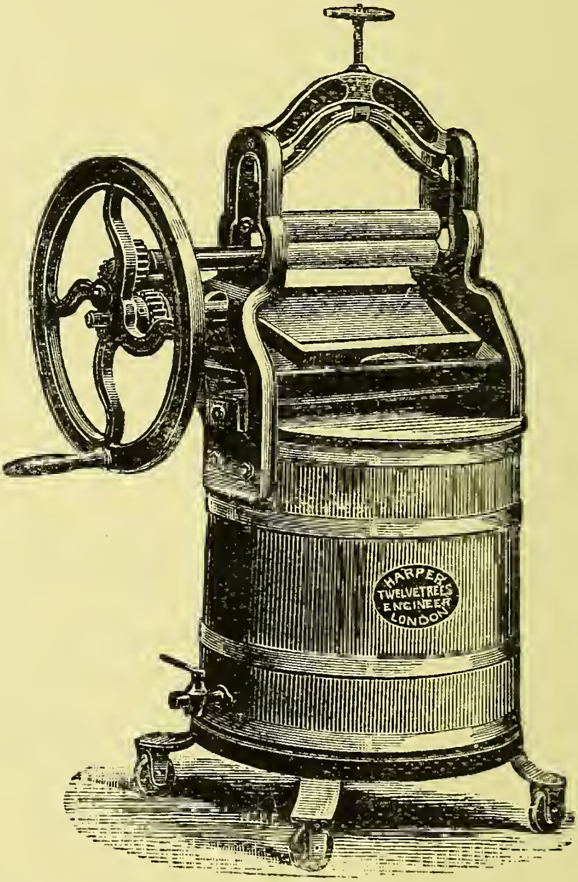


Fig. 7.—Upright Barrel Washing Machine (Twelvetrees' Villa Washer).

box, being guided by anti-friction rollers. The rack actuates the pinion fixed to the top shaft of the dolly. The machine is made without rollers, and also with indiarubber and wooden rollers. The illustration shows a machine with wooden indiarubber rollers.

Revolving Barrels.—Another distinct class of manual washing machines, suitable for family and cottage laundry use, is seen in the revolving barrels. These are round or octagonal barrels provided with water-tight doors. At one end of the barrel there is a strong metal spike, and at the other a cogged cap and spike; the barrel is hung in special bearings (by means of the spike), and remains hanging in a strong wood or iron frame. On one side is a driving-wheel attached to cog-wheels, fitting into the cogged cap of the barrel. By working the driving-wheel the barrel is set in motion and made to revolve.

The interiors of these barrels are very differently arranged. Some are fitted with fixed beaters attached to a transverse metal bar; others with movable beaters also attached to a transverse bar which in this case is connected with the outside cog-wheels. The best types are those without interior beaters or bars; in these latter machines the linen is simply washed by its being constantly thrown from side to side, and also by the slight friction of the uneven surface of the barrel; this closely replaces the action of hand-rubbing.

Eccentric Motion.—A really ingenious improvement on the last described type of machine is the imparting to the barrel an eccentric motion, either by itself or in addition to the rotary motion. This eccentric motion is an up-and-down, side-to-side movement, causing the clothes inside the barrel to be dashed from left to right, and from right to left. Owing to a simple arrangement of cog-wheels and levers this additional movement is produced without any increase of labour, while of course it considerably shortens the process of washing.

Water-tight Doors.—All the foregoing washing machines are provided with felt or wash-leather padded water-tight doors, fastened down by means of ordinary screws, or some other specialised and more elaborate arrangement. When used the clothes are placed in the barrels, being distributed lightly so as to about fill up one-third or rather less of the entire barrel; hot water or prepared washing fluid is then poured in. This done, the door is fastened, and the driving-wheel set in motion. The barrels should be made to revolve rapidly for from twenty to forty-five minutes, according to the quality and condition of the linen actually being washed. The linen is then removed, and either passed through the wringer rollers or placed aside to drain. The dirty water is drawn off by means of a tap, and fresh washing fluid placed in for another batch of dirty linen, or clean tepid water is placed in the barrel in order to rinse the cleaned articles.

Rinsers.—All the above described machines act very well as rinsing machines, and, where the amount of work to be got through will allow of it, they may be safely used as such.

Dash-wheel Washers.—The dash-wheel type of washing machines was one of the earliest departures from the old-fashioned upright barrel and dolly. We have virtually two kinds of dash-wheel machines in the market—the open and the closed. Both kinds have been constantly and greatly modified by many engineering firms. The most simple form consists of a square box, or half-section of a barrel, mounted on wood or iron standards. The dash-wheel, or cage, consisting of two circular ends and many round or flat bars of wood or metal, forming a cylinder, is hung midway in the outer case or washing box; one end of the dash-wheel is connected with a cogged wheel fitting into another one, which is generally connected with a smaller one attached to the driving arrangements, and which can be put in or out of gear at convenience. These wheels are set in motion by a large driving wheel, or an iron arm with a handle; in powerful machines the gearing is connected with a steam-engine.

The machine when in use is about half filled with water or washing liquor, the linen being placed inside the dash-wheel, and thus when the machine is in motion the linen is thrown from side to side and most effectually rubbed against the dash-wheel bars.

The more complicated dash-wheel machines are fitted up in strong closed wood or metal boxes or cylinders, one section at the top opening to allow of the placing in the linen, cleaning out, etc. The doors of such machines are water and steam tight, and enable a greater power to be used during the operations. In most cases these large dash-wheels are fitted with water, and sometimes steam supply pipes, as well as a tap at the bottom for draining off the dirty water. The methods of working are the same in all dash-wheel washing machines, but in most of the large machines now made an automatic reversing of the revolving motion is secured, by a more or less simple arrangement of cog-wheels and levers in the working parts. This reversing of the motion produces a decidedly good effect, as the linen is first dashed round to the right and then to the left, and in being forcibly propelled through the soapy water, the linen is quickly cleansed by a quite harmless mechanical action, in which the water takes the principal active part. As we have already pointed out, this reversing motion of rotary washing machines is of great service in another direction, namely, the prevention of *roping*.

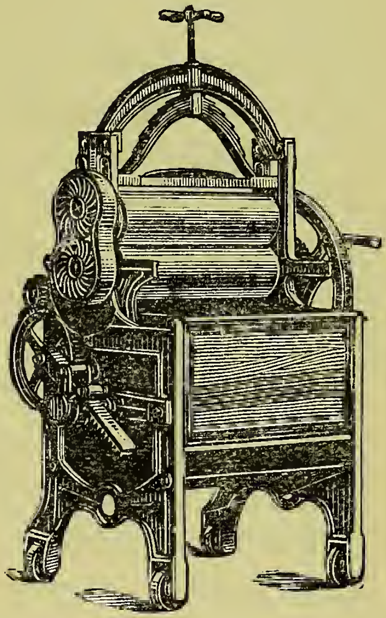


FIG. 8.—DASH-WHEEL COMBINATION WASHER.

This class of machine is now made in all sizes, both for hand and steam power. In some cases a wringing or mangling arrangement, consisting merely of simple wood rollers, rubber and composition rollers, or steam-heated metal cylinders, is fixed over the top of these dash-wheel machines, the surplus water driven out by the rollers falling back into the reservoir.

Rapid Oscillating Washing Machine.—A comparatively new invention in washing machines has been patented by Mr. Samuel Wright. It is claimed for this machine that it is very compact and will save much labour and time in use. The specification sets forth that the "invention comprises an improved construction of apparatus in which a box is oscillated on fulcrum levers and centres below it, either by hand or it might be by a reciprocating motive power mechanism. The apparatus requires very little power. The box is fitted with a reacting pendulous weighted lever, which tends to bring back the box to its normal vertical position, and assists and steadies the action and reaction of the oscillatory box, so that it is worked more easily by the person or the motive power employed than the apparatus now in use, in a similar manner to that of the action of a pendulum of a clock."

Practice confirms the claim that very little power is required to work the machine. The pendulum action is not a bad idea, but the oscillation of the whole box is a drawback.

The "Invincible."—This patent of Messrs. Watson & Whalley consists of a square box mounted on four short legs provided with rollers. About an inch from the bottom of the box and inside is a perforated false bottom, kept in its place by screws and a board on the right-hand side, which is fixed a few inches from the side of the box, and reaches just a little short of the top. A piston is placed inside the box, and is worked up and down by means of a jointed arm attached to the shafting at the back, which is set in motion by the driving-wheel at the side of the machine. The piston is hollow and supplied with a lid. The clothes are placed in the washing liquor and the piston set in motion, forcing the water downwards through the clothes and the perforated bottom; the water rises where there is least pressure, behind the side board, and, flowing over, finds its way on the top of the piston lid and through valves provided for the purpose, which open when the piston is raised. In this way the flow of water is continually kept up, the washing liquor or clear rinsing water being driven through the linen with considerable force. The idea is to force out the dirt without rubbing or beating linen. And this plan is well calculated to attain the end in view. The Invincible machines are worked with ease, and the patentees also specify the adaptability of the device to power-driven machinery; in this case the driving-wheel is substituted for a pulley or drum on which to place a driving belt. The Invincible machines are fitted with a pair of wringer rollers regulated by a spring and screw, and kept in their places by an overarching tie-bar, which also supports the driving shaft. Both the piston and rollers are worked by the same driving wheel, a lever putting either one or the other in or out of gear. A tap is placed at the bottom of the machine for the withdrawal of water.

Steam.—The practice of utilising live steam* as the sole mechanical action in washing soiled linen is an old one, and, indeed, has been followed probably from time immemorial by many savage tribes who, taking advantage of natural geysers or syphon-like hot springs, have effectually cleansed dirty fabrics at little cost of labour. In California and other parts of the United States of America and in Mexico, where these hot springs are alkaline, or contain borax in solution, the work of these natural laundries is marvellously rapid and effective. In New Zealand, Iceland, and parts of Europe, geysers are capable of doing much the same kind of work.

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* *Live steam* is steam applied directly to any object, in contradistinction to *dry steam*, which is steam applied in pipes or in a jacketted chamber, &c.

The principle of utilising steam is a very simple one. It consists of forcing moisture at a high temperature through linen, or even through and through the actual fibres of soiled fabrics, and by the mere mechanical action of the steam thus applied driving out the accumulated dirt, which we may put down as a combination of fatty matter and earthy particles. The mechanical way of making use of steam for washing purposes is this: A steam-tight receptacle, taking the shape of a barrel, tank, or box, is connected by one pipe to a boiler and by another to a condenser. The soiled linen is loosely packed in the tank and the door carefully fastened, a steam cock is then turned on and live steam rushes in through a wide pipe. When the tank is charged at a pretty high pressure another cock is turned on, allowing the steam to escape through a smaller gauged pipe into a condenser. After a lapse of ten to fifteen minutes the steam is turned off and the linen removed and immediately rinsed in slightly lathered warm water, when all the dirt is rinsed out. As a rule, linen treated in this way is usually soaked for a few hours in soapy water before being packed in the steam tank. This method of washing is in use on the Continent of Europe, but is not widely known with us, although of late years the process has been adopted by competent hygienic authorities as the most reliable method of disinfecting textile fabrics.

Automatic Washing by Steam and Water.—A modification of the above method is extensively in use on the Continent. Large boilers are fixed in masonry, and are provided with warm water supply and waste-water pipes and cocks. These boilers are provided either with perforated steam coils rising from the bottom to within a few inches of the top, or with a steam tube passing at right angles about half-way down the boiler. In the latter case the tube is also perforated, one half with the perforations to the left, and the other half with the perforations to the right. The linen is placed in the boiler and hot water run in to about three-fourths of the capacity of the tank. Soap or lye water is generally added. This done, the steam cock is turned on and the steam rushes in at high pressure, causing a violent and continuous ebullition to take place in the water, which is found to produce a sufficient friction on the linen. In practice it was frequently found that the use of steam was excessive, but by closing the top and having an escape pipe to convey the waste steam where it can be utilised, economy in this respect has been effected. Of course the hot water in the boiler is necessarily kept at a high temperature by the steam, thus doing away with the necessity of separate boiling.

Harmen's Patent.—An ingenious application of this principle has been patented. Harmen's self-acting washing machine is a veritable automatic construction, and proves extremely useful for family work, or in small laundries. It is merely a large metal pot, provided with a well-fitting cover, and which when used must be placed over a fire. A false bottom is put in when the machine is used and also a circular tube, pierced with many holes at the top. This tube is placed loosely on the false bottom, and the clothes packed round it (but not tightly), when the vessel is to be nearly filled with warm or hot water in which soap and borax have been previously dissolved, and the whole machine placed on the fire. As soon as the water approaches the boiling point, the heat, in rising, forces the water upwards through the tube, and, escaping through the holes at the top, at once sets up a constant upward and downward flow of the soapy water. This movement soon becomes extremely rapid, and then forces the liquid through and through the fabric being washed. By this means no manual or other friction is necessary; and while the dirt is speedily detached from the fibres and washed away by the lathered water, a great economy in soap is effected. Soiled linen should be soaked before being put in the automatic washing machines, but that is all. These clever machines are made in several sizes, but can be manufactured on as large a scale as may be required. The patentee claims that the 35s. sized machine, which weighs only 12 lbs., and being 14 inches high by 14 inches wide, and 21 inches long, will wash in one hour, at the cost of fourpence, two pairs of sheets, six shirts, six undershirts, six pairs of socks, six pairs of stockings, and twenty-four handkerchiefs. Provided the linen be not too much soiled, we should say that the above work can be done very satisfactorily at an expense of sixpence at the outside.

The Paragon.—The Paragon washer is a small metal instrument in the shape of a funnel or filter for liquid. The long spout is covered with a round cap provided with a number of holes. This instrument is placed in an ordinary wash-house copper, the clothes being packed round it and the washing liquor poured in, but leaving the head of the Paragon well out. When the water commences to boil the heat causes the water to rise, and it does so through the filter, coming out through the holes under the cap. In this way a constant flow of water is kept up automatically, and by passing through the linen at a rapid rate and some force, drives out all grease, dirt, etc. The cleansing action is effectual.

Hughes's Patent Fountain Washer.—Hughes's patent (Fig. 9) is an elaboration of the above described machine. It consists of a hollow and slightly concave disc fitted on several low feet; from the centre of the disc rises a jointed hollow tube, surmounted by a cap with holes. This machine, which is made in several sizes, is placed in a copper or large cauldron and the water placed inside, the same precaution of not covering the top being necessary.

The several appliances which have been described above are the principal truly automatic washing machines, in which we see steam taking the most active part. They are all effectual for cleansing clothes, and certainly obviate the necessity of scrubbing; but this very point of placing the dirty clothes in hot water with soap and washing them by the help of *boiling* water tells against their use for all delicate fabrics and linen that must be kept white. Our remarks on the subject of boiling linen will make this perfectly clear. Of course, giving the linen a long soaking, and then rinsing and wringing it before placing in the copper, would make a considerable difference. For coarse and very soiled linen these automatic machines will be found very useful in private households and small hotel or school laundries.

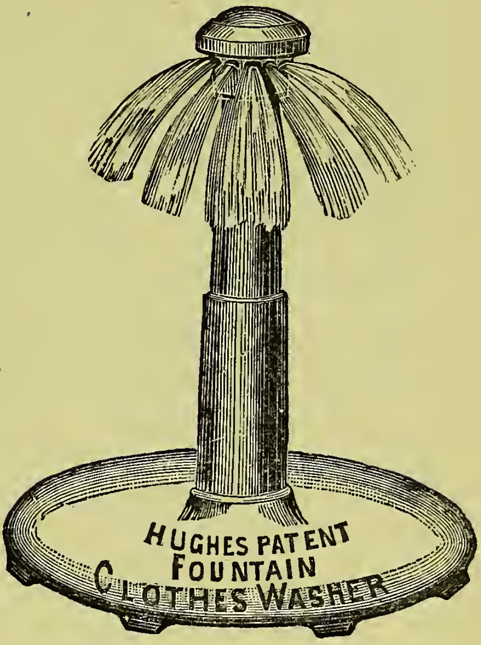


FIG. 9.

We would observe that in using these automatic machines great care should be taken to employ only soft and pure coloured water. Seeing that the water is continuously being forced right through the tissues, when a deposit of salts held in solution in the water would be facilitated, this precaution becomes of the utmost importance.

CHAPTER XVII.

STEAM-POWER WASHING MACHINES.

Steam Dash-wheel Machines—Rotary Steam Washers: Twelvetrees', Manlove's Patent, Summerscales's, Hall's, American types—Eccentric Motion—Revolving Dash-wheels—Macalpine Patent—Combination Machines—General Remarks; Fixing Machines and Cleaning.

Steam Dash-wheel Washing Machines.—Many firms now manufacture dash-wheel washing machines to be worked by steam. These machines are constructed on the same plan as those described in the preceding chapter. But when intended to be worked by steam power the dash-wheel is usually enclosed in a steam-tight outer casing, provided with pipes and stopcocks for the supply of water and steam, as well as an outlet for dirty water. The outer mechanism for the working of the inner cage differs according to the manufactory turning them out. It generally consists of a series of cog-wheels, or a racket and pinion, connected by a chain cable communicating with the driving-wheel on a steam-engine, or a drum for the reception of an endless belt which is slipped over a similar drum on the shafting. A connecting and disconnecting gear is usually provided, enabling any one machine to be stopped almost instantaneously without stopping the engine, or disconnecting the main shafting transmitting the motive power.

Rotary Steam Washers.—Undoubtedly the most universally used machines for washing in large public or private laundries are the rotary machines worked by steam. The different types of the rotary machines are numerous. Of the many laundry engineering firms catering for the public, most turn out one or two types of the rotary, often having a great dissimilarity, not only in accessory parts, but even in the vital parts of construction. We shall, therefore, first describe the best form of the rotary machine in general terms so as to convey an idea of the principle, and subsequently furnish some important details of distinctive types and improvements, offered by the leading manufacturing firms in this growing trade. It must be remembered that a machine may have peculiar advantages to offer under different circumstances.

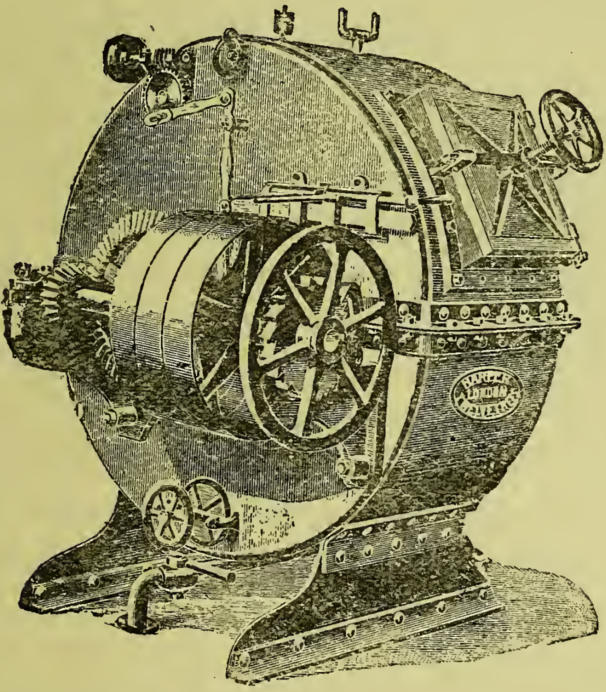


FIG. 10.—ROTARY WASHING MACHINE (TWELVETRFES').

Broadly speaking, then, the rotary washing machine (as manufactured by Harper Twelvetrees'—see illustration—and other firms) consists of an outer casing, usually cylindrical in form, either made of metal plates, wood sections, or broad staves (Fig. 10). These cylindrical casings are, in some instances, very long, in others, short and squat; they are fixed to the laundry flooring either on their own cases, or by powerful standards on which the machine is firmly mounted. The latter is the most common and approved style. Some of these casings are made in two half-sections, like boiler-plates, rivetted together, and with separate end pieces. A steam-tight door is provided in the upper front section. In some machines the door is only just large enough to conveniently allow of putting in the linen and taking it out. In others, nearly a quarter-section of the top part of the outer casing opens on strong hinges. Though this long opening from end to end is convenient in many ways, it has its drawbacks, as it is far more difficult to make such a large door sufficiently steam-tight than is the case with the smaller door, which is more specially affected by English makers of laundry machinery. Inside these cases are large cages, hung on bearings connected on one side with the outer working parts. The cages vary greatly. Some are made of perforated wood or metal, others of bars. The cages are provided with doors for the insertion of linen. Occasionally the cages are divided into one or more compartments, outside on the side are placed the working parts, cog-wheels and drums for the reception of driving belts, and disconnecting gear. There are also pipes for the supply of cold and hot water, and also steam, in which latter case the machine is always provided with a safety valve. Thus far the general outline; now for details.

Rotary Washing Machine (Manlove).—Messrs. Manlove, Alliott & Co., Limited, turn out a large-sized machine with an outer casing of boiler plates, mounted on iron standards (Fig. 11); the case is furnished with a safety valve, pipes and cocks for the supply of hot and cold water and steam, and an outlet pipe. There is a door provided with exceptionally powerful fastenings, and a copper drip plate. Internally there is a cylindrical cage formed with small copper rods closely placed together; it revolves on a central shaft resting in gun-metal bearings, and is provided with a sliding door. Attached to the central shaft are two midfeathers composed of brass tubes ; these are placed horizontally and divide the cage into two. The linen is placed inside the cage, washing liquor is poured in and the outer door fastened, when hot or cold water is turned on. The inner cage is made to rotate by a counter-shaft, fitted with fast and loose pulleys for the reception of the belting. But every three and a half turns, the revolving movement is automatically reversed by means of a special lever and slide. This reversing prevents roping of the clothes. The machine is also fitted with a starting and stopping clutch gear, and a fork for the purpose of preserving the belt in its place. The machine being fitted with the supply and outlet pipes allows the whole operations of washing, boiling, and rinsing to be done without removing the linen or opening the doors. The dirty water is let out, and warm water let in, when the machine is set in motion for a few minutes ; then it is stopped, the water let out and more hot water run in, which is soon raised to the boiling pitch by the introduction of steam. After a period of rotating in boiling water, the linen may be rinsed, first with warm and then with cold water.

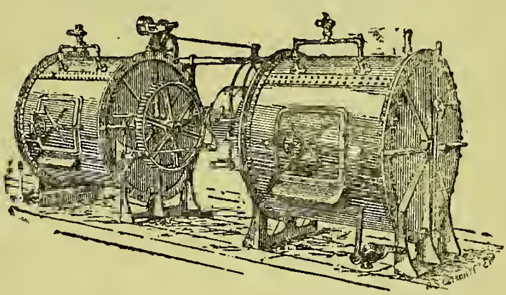


FIG. 11.—ROTARY WASHING MACHINE (MANLOVE'S).

Other Types.—Messrs. Summerscales & Sons manufacture a rotary steam washing machine with an outer casing composed of mild steel ⅜-in. thick and made in one piece. A door with a screw is provided. The end pieces of the cylinder are firmly rivetted on, and the shaft working the inner cage is connected with a large cog-wheel fitting into a small one attached to the double pulleys. The rotary motion is automatically reversed.

A special patent arrangement is provided for locking the inner cage when not worked, for the better safety of the workpeople. The inner cage is of brass plates, and is perforated with many holes. The machine is also fitted with safety valve, inlet and outlet pipes.

Messrs. Hall, Limited, make a rotary automatically reversing machine. The outer casing is made in two half-sections firmly rivetted together, and two end pieces. There is an inlet door on the upper section, and a door for cleaning out behind on the lower half-section. The cage is made of brass or copper rods, and is divided, longitudinally, into two compartments, also with copper rods; each compartment has a separate sliding door, with a fastening catch. There are safety valves, supply and outlet pipes, and suitable driving gear. The machine is very neat and compact, much care having been taken to dispense as far as possible with intricate outer gearing. It is worthy of notice, that if anything goes wrong internally, any competent engineer or mechanic can unscrew the top part of the outer case, and thus remove the inner cage to remedy any fault. If placed in a ground-floor room on good flagstones or concrete, the machines will not require any foundation.

The American washing machines are generally long cylinders, made in wood or metal. We disapprove of wood, so take as an example a long machine with an outer casing made of two half sections of brass, and two end pieces, the whole being carefully rivetted together. The machine is mounted on four short iron standards. The door is a very large one, occupying about one-fourth of the machine. This allows of the linen being quickly put in and taken out, and also ease in cleaning when necessary. But there is far less safety in these large doors when steam at high pressure is used. The inner cage is made of brass plates, perforated, and two end pieces. There is no central bar, the cage being suspended in strong bearings by spikes. The supply pipes for water and steam are on one side, and the driving gearing, reversing levers, and stopping and starting clutches are on the other. The outer case is fitted with a safety valve and a water gauge.

The Americans specially affect the large quarter-section doors, and for the inner cages, perforated plates or staves. This is to be observed both in the all-metal, all-wood, and metal and wood machines.

We prefer moderately-sized doors and barred cages. The metal rods allow free ingress to the washing fluids, and under no circumstances can they possibly interfere with the linen being washed. The policy of dividing the cage into compartments, longitudinally or crossways, seems very doubtful, more especially when the division is made of unperforated wood or metal plates. The idea is, that by having two compartments, and thus separating the linen, the machine will bear being much more heavily loaded. But as the space at disposal is always the same, it is difficult to see how this can be. On the other hand, having compartments makes the proper cleaning of a machine a more troublesome and difficult task. We also hold that the less impediment to the free floating of the linen the better. For this reason, we strongly object to central bars running midway in the cage; the cage can easily be secured in its bearings without these bars, and they are certainly better away. Internal bars will sometimes cause roping, although with the reversing motion this danger is, of course, greatly lessened. In some of the early types of machines, these central bars were armed with fixed or revolving beaters, but they did much more harm than good, tearing the linen terribly, and so they have been almost entirely discarded.

Another point of great interest is the question of wood *versus* metal. Almost all the early machines were made of wooden staves or panels. And although now most of the heavier machines are made entirely of metal, wood still holds its own in some quarters. The drawback to the use of wood is that it swells very much under the pressure of hot water and steam. Leakage then becomes common, when the wood is even apt to splinter or gape asunder in inner seams, resulting, as a matter of course, in serious damage to linen. Wooden barrels and cages are also more difficult to keep clean, and when strong alkalies are used, or the linen is very soiled, mischief is sure to follow. Metal is supposed to be more expensive, and to render the machines heavier, and altogether more difficult to manage. In the early days there was something to be said about the damage done by rust. But our manufacturers have so improved matters that metal machines are now not much more expensive or much heavier than the wood ones. And the difficulty of rust being done away with by using brass, copper, gun-metal, etc., there is a great advantage to be set off against the splintering and porous qualities of even the best seasoned wood. Experience in large laundries would seem to teach that good metal alone is the fittest for heavy machines with boiling water and steam supply. Wood and metal may be allowed in smaller machines (especially hand-power types), which are not subjected so constantly to severe tests. In smaller machines, too, the supervision of the wood can be much more thorough.

Eccentric Motion.—Taking Taylor's patent eccentric combined dash-wheel washing and wringing machine (Fig. 12) as the most perfect of its kind driven by steam power, we shall see that this system does not differ from that described in the last chapter. We have here a square or hexagonal box; there is a steam-pipe on either side, supplying a perforated steam coil fixed at the bottom. This case is also fitted with hot and cold water pipes, an outlet cock, and an overflow pipe, within a few inches of the top. A hexagonal perforated wood cage is placed in the box, and hung on suitable bearings, connected with the outer driving mechanism. The inside of the cage is slightly corrugated, to impart a moderate friction to the linen; the cage is provided with a door, but which does not require to be steam-tight. When once the linen is placed in the cage and the door is fastened, warm

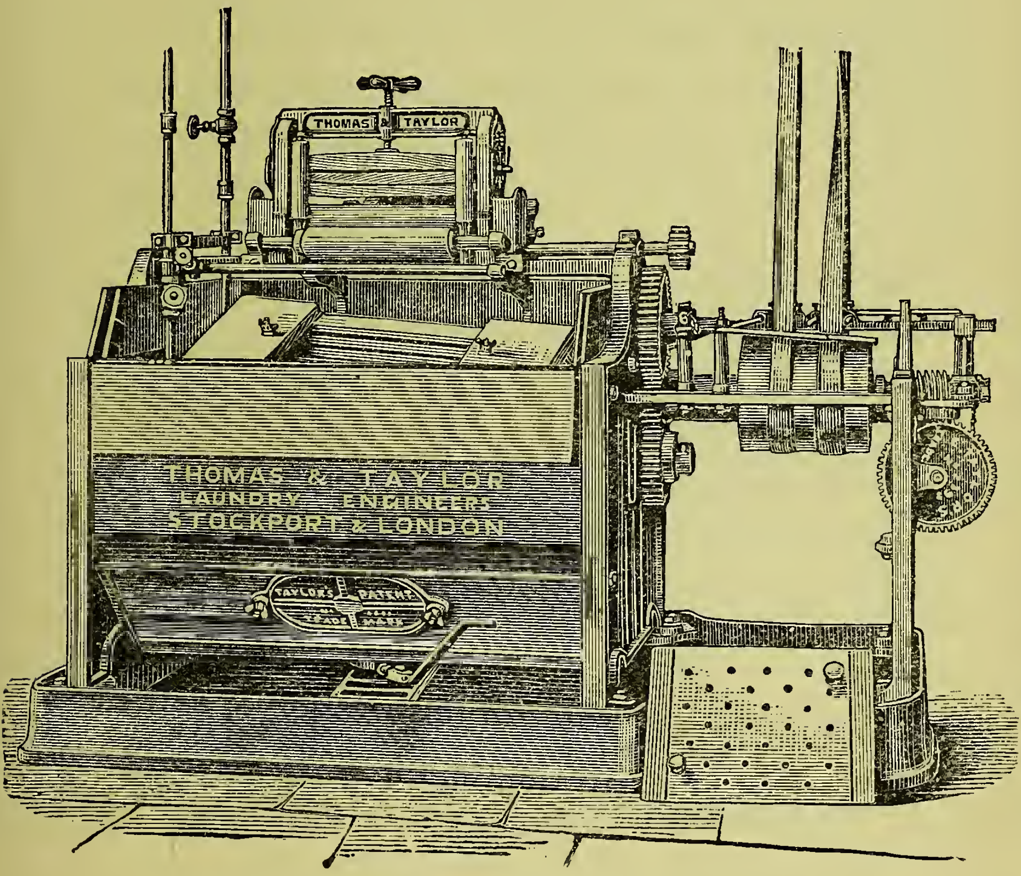


FIG. 12.—TAYLOR'S WASHING AND WRINGING MACHINE.

water is allowed to run into the outer casing, until it is nearly full; the cage being perforated, the water is naturally on the same level inside, and the clothes consequently immersed in the hot or cold water. The steam tap is now turned on and the water soon becomes boiling. The temperature is regulated by means of the steam and water supply, all superfluous water being taken off by the overflow pipe. Now for the motions. These are twofold, rotary and eccentric. The tumbling of the inner cage from left to right and right to left is managed by outside levers connected with the gearing. The rotary motion is automatically reversed. By these combined movements the linen imprisoned in the corrugated cage gets a thorough but safe friction and kneading.

It is to be observed that the linen may be soaked, washed, boiled, rinsed, and even blued in these machines. They certainly possess many advantages, and do not wear themselves out so rapidly as do dash-wheel revolving machines. But it must be confessed that a great expenditure of steam is necessary to keep up the temperature in the open box.

These machines are fitted with pairs of rollers, adjusted by self-acting levers and weights, or by strong wood springs and screws; enabling the linen to be wrung after each operation, the water falling back into the machine.

Messrs. Summerscales & Sons also manufacture an open box washer, with dash-wheel cage, steam and water supply, rotary motion, reversing after a few revolutions, but without the eccentric motion. These machines have a permanently fixed pair of rollers, regulated by springs and endless screw. The same drawback against the loss of heat applies in this case.

Revolving Dash-wheels.—Several laundry engineers are working patents for revolving dash-wheels. These machines are circular or many-sided barrels or long cylinders, hung in various fashions on bearings connected with iron standards. These washing machines are made in metal or wood; are provided with steam-tight doors, and supply pipes for steam and water. The inside is occasionally divided into one or more compartments. The usual driving gearing is fixed to one side of the standards; when connected with the revolving shafting, the belts cause the dash-wheels to swing round bodily. Sometimes the eccentric motion is combined with the rotary movement; as a rule the machines are automatically reversed. In the most simple form the linen is washed by being dashed through the water and against the sides of the machine (this is why the hexagonal or octagonal form is so much affected). In other instances, the inside of the machines are corrugated or provided with a midshaft with beaters. The action of these machines is just what is required when automatically reversed, but it is not without danger that such heavy machines are swung round and round. The power required to move the machine is greater than is the case with the lighter perforated internal cages. The wear and tear to the machines themselves and the shafting is also excessive. Revolving dash-wheel washers are usually short-lived machines.

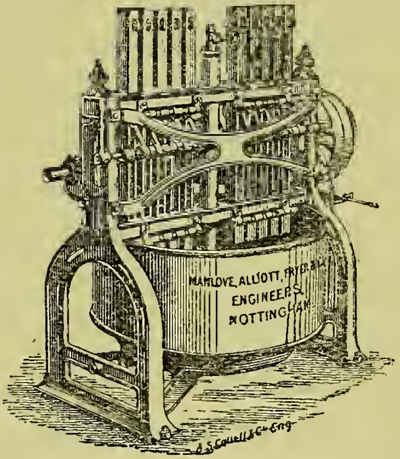


FIG. 13.—MACALPINE'S WASHING MACHINE.

Macalpine's Washing Machine. — The Macalpine patent (Fig. 13) is an old one, but still holds its own, more especially for doing hard and rough work. It is on a different system from any other machine in the market. There is a cast-iron circular pan fitted into a cast-iron frame. A vertical hollow shaft is placed in the centre, supported by the overarching tie bars of the frame; it acts as a steam conductor. At the bottom of the pan is a set of perforated brass steam pipes. These are covered over by a false perforated bottom. Ten wooden beaters, five on either side of the steam shaft, rest on the false bottom, and are kept in their places by the tie-bars and working gearing. The pan is fitted with an outlet valve. A horizontal shaft, supported by the frame, is connected with the beaters. The action of the Macalpine machine is twofold. The circular pan revolves, the motion being imparted by a horizontal shaft acting on a circular racket at the bottom of the pan. The shafts (the top and bottom horizontals) are set in motion by fast and loose pulleys round which driving belts are passed. The upper horizontal shaft acts as a lifter to the beaters, which rise and fall alternately upon the false bottom; each beater is provided with a wood stop which falls on a rubber pad fixed to the tie-bar. When in use the pan is three-parts filled with washing liquor and the soiled linen placed inside, the steam is turned on, descending through the vertical shaft to the pipes, and, escaping through the perforations, imparts a buoyant motion to the clothes and heats the water (up to boiling point if desired). The driving gear being now connected, the circular pan revolves, and at the same time the oak or limewood beaters rise and fall. By this double movement the linen is continually receiving a soft thud in every direction, and the rising steam prevents the linen from roping or getting into heavy bundles. Much of the dirt falls through the perforations of the false bottom, and is thus kept away from the clothes. The cleansing action is very effectual, and it is claimed that the linen is not damaged in any way by the beating. The machines are intended for general use, and doubtless could wash all kinds of fabrics. In extensive practice, however, rotaries are preferred for light and general work, the Macalpine machines being reserved for treating coarse and heavily soiled goods.

Combination Machines.—We have spoken of several machines (dash-wheels, eccentric motion, upright tubs with dollies, etc.) being fitted with clothes wringers. These machines are known as "combinations." Of course rollers cannot be attached to rotaries or revolving dash-wheels. These combination machines have many advantages for the laundryman whose available space is limited. With these no wringer machines are necessary. And then linen, when once washed, may be passed through the wringers at once, the dirty water being allowed to fall back into the machine and run out by the outlet pipe. The linen may be thrown back and hot water run in, when the whole mass can be rinsed for a few minutes, the warm water run off and cold water run in, and a few more minutes devoted to rinsing. Now once again the machine may be emptied and the clothes wrung, when they may be replaced and some prepared blueing water poured in; after this the clothes may be finally wrung. Thus, it will be seen, all the operations are gone through without the trouble of moving the wet linen any distance. These are great advantages. On the other hand, when space is not too limited this proves a really expensive plan to a busy laundryman. It must be remembered that washing machines are far more complicated, and consequently expensive, than plain rinsing and wringing machines, and so it is a bad policy to keep an expensive machine occupied in doing the same work that could be done by a less costly one. In large laundries these matters are of importance, and it will be found more economical to have separate washing, rinsing, wringing, and blueing machines.

As a general rule, heavy washing machines do not require any particular fixing to the flooring, as their own weight keeps them in their places; lighter power-worked machines, and most of the heavy revolving dash-wheel washers, require some kind of fixing to the ground. Even in these cases, however, no special foundation is required, the machines are merely rivetted down to iron rails, or screws are forced into imbedded sockets.

Care should always be observed in keeping the inside and outside of washing machines clean. The working gearing must also be kept free from dust, soapsuds, etc., and frequently but cautiously lubricated. The machines ought to work easily and smoothly, but there should never be any excess of oil or grease about, which might possibly get inside the machines or contaminate the linen in some other way. In many cases, the patent automatic lubricating gearing and bearings are fitted to laundry machinery, and where cost is but a secondary consideration this improvement cannot be too highly recommended,

CHAPTER XVIII.

RINSING AND EXTRACTION OF MOISTURE.

Rinsing Machines—Dash-wheel Rinsers—Wringing Machines: "Tit-Bit" Wringer—Hydro-Extractors: Alliott & Haughton's Patent—Blueing and Starching Machines.

Rinsing Machines.—For reasons already sufficiently dwelt upon in our last chapter, it will be a source of economy for the laundryman in a large way of business to invest in one or more good rinsing machines.

A very elementary type of the rinsing machine consists of a wood or metal tank, sometimes divided into two compartments, fitted on standards, and having a wringer attached to it, together with hot and cold water supply pipes and an outlet tap. The machine is used by turning on water into the tank and soaking the linen, which should be agitated by hand or with a short pole. The first rinsing should take about ten minutes in hot or warm water. The water is then emptied and cold water run in. After due agitation, the linen is passed rapidly through the rollers.

Good examples of hand-rinsing machines are manufactured by several firms, providing a continuous flow of water. These machines are formed of a tank or trough mounted on cast-iron standards. There is a hot and cold water supply pipe, an outlet pipe at the bottom, and two overflow slits about a couple of inches from the top of the tank, and communicated with a waste pipe with an outfall into an open drain. When the linen is placed in the tank fresh from the soapy washing fluid, the warm water tap is turned on and the tank soon fills, the surplus water flowing away at its *highest level*, thus taking away the soapy and dirty scum, which is produced by the vigorous agitation of the linen. The flow of hot and cold water is easily regulated, and a very heavy wash may be rinsed without the trouble of running out the water by the waste pipe. These machines are generally combination ones, being fitted with spring wringing rollers.

In other machines the hot and cold supply pipes are near the bottom of the tank, just above a false perforated bottom; the overflow slits are as usual near the top. By these contrivances the water is forced up, all scum being floated off by the overflow slits and heavy sediment settling down under the false bottom, out of the way of the linen and inward stream of water. Such machines may be kept going uninterruptedly during a whole working day. One woman agitates the linen and regulates the hot and cold water supply by turning on or off the taps fixed to the side, whilst a second woman guides the linen through the rollers. The rollers may be worked by manual labour or by power.

There are a great many more modifications of the hand-rinsing machines, every manufacturing firm adopting some one or two particular features, but they all practically fall under one or other of the above-described types.

Dash-wheel Automatic Rinsers.—One of the best forms of dash-wheel rinsing machines is Messrs. Manlove, Alliott & Co.'s four-pocketed drum (Fig. 14). This is a large machine, in the form of a huge drum. Internally it is divided into four compartments, each having a separate round hole for putting in and removing the linen. Each compartment is also provided with a metal midfeather. The wheel or drum is made in wood.

bound with metal. "The wheel is fitted on a heavy iron shaft, which is hermetically protected by wood, bored, fitted with brass pipes for conducting water into each compartment whilst the wheel is in motion, turned at each end, and furnished at one end with a brass gland, stuffing-box, brass lubricator, and inlet valve, and at the other end with a spur wheel and pinion, actuated by a set of counter-gearing consisting of fast and loose pulleys with their belt fork tackle, etc." The gearing is also fitted with steel clutches for stopping the machine in any desired position. The standards on which the drum is mounted are short, and made of cast-iron.

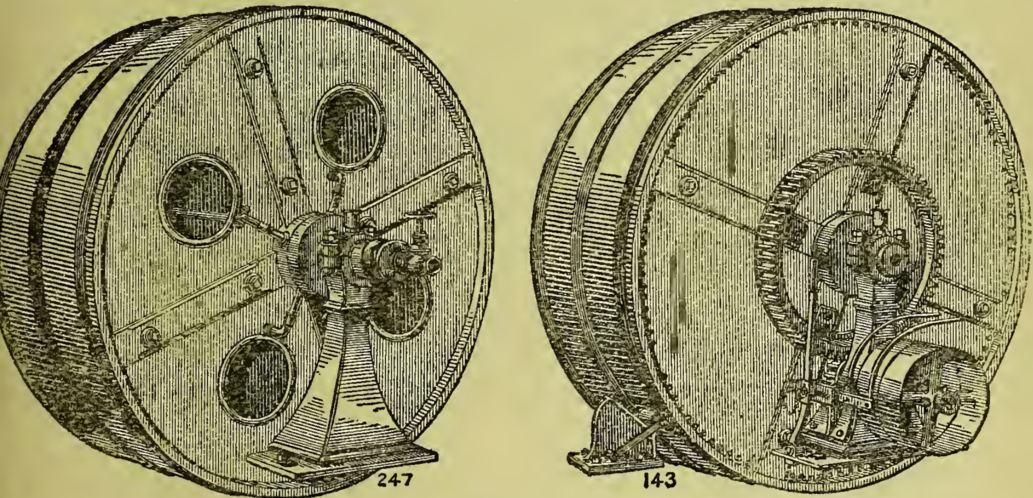


Fig. 14.—Dash-wheel Automatic Rinser.
Front View. Back View.

The way of working this machine is very simple. A load of linen is placed in each pocket, and the doors closed, when the machine is set in motion. A continuous flow of warm water is automatically kept up as long as the wheel revolves. The linen is thus thoroughly soaked in an ever-continuing stream of pure water, the scum, etc., being carried off through the outlet valve. The linen is, moreover, gently thrown in all directions, from one end of the compartment to the other, by means of the midfeathers, which are composed of copper tubing. This endless flow of fresh water, and the thorough automatic turning and returning of the linen is a great advantage, as it ensures complete extraction of soap, etc. The flow of warm water should last for from five to ten minutes, when the inlet flow is changed to cold water. The whole process takes from ten to fifteen minutes.

These dash-wheel rinsers are made specially water-tight for the purpose of being used as carpet washers and bleaching machines.

Very simple many-sided dash-wheel rinsers with eccentric motion are also constructed; but these are without the continuous water supply. Some of these last take the form of revolving barrels, without inner cages. The same objection, although in a lesser degree, attaches to the use of these rinsers as already specified with regard to the revolving washing machines.

Wringing Machines.—Wringer rollers are composed of many different substances, wood and rubber being the most commonly employed.

Wringing machines are either made as separate machines or in combination with washers and rinsing troughs.

Those made for separate use are generally mounted in pairs in a strong cast-iron frame, which frame may be mounted on substantial standards, or fitted with screws for fixing the rollers on a tub or table. The rollers are perfectly round, with metal spikes at each end, which fit in bearings in the frame. The rollers are pressed tightly together by means of a spring, generally spanning over the rollers, and regulated by a long adjusting screw, fitted with a wheel for handling. The bearings are connected with cogged-wheels fitting into other cog-wheels attached to fast and loose pulleys (when driven by power), or to a driving-wheel with handle (for manual labour).

Wood rollers should be carefully tended; they are made of some peculiarly hard timber. Rubber rollers are made of thick rolls of india-rubber, or certain patented compositions, tightly adjusted and cemented on to wood or metal spindles, the ends of which are hung in the working bearings.

The arrangement of springs varies greatly. In some machines the action of the springs is automatic, keeping the rollers tightly pressed together, and only giving way a little when clothes are being passed between the rollers. The springs may be either in metal or wood, and either span the rollers, or two pressing separately, one on each end of the upper roller.

Other rollers are adjusted by means of self-acting lever and weights, pressing down on the rollers.

Most wringing machines are provided with a receiving board on one side, and a drip plate or board on the other for draining the water back to the machine or a pan.

Rubber rollers with double or one single metal spring, with adjusting screw, seem to be preferred in the laundry trade.

"Tit-Bit" Wringer.—This wringer (Fig. 15) is a newly patented contrivance. The rollers are made of hard brass, which enables the wringer to be used as a mangle, and also ensures a polished finish to all linen passed between the rollers. The principal peculiarity of the machine, however, is that the rollers never quite touch one another, so that there is no pressure on the roller surfaces or on the bearings, except when the clothes are being passed through. A very simple lever regulates the pressure; the springs (strong steel spirals) are concealed in the frame containing the bearings. The right ends of both roller spindles are fitted with cogs, and the upper one has an iron arm and handle fixed on for working the rollers. In large-sized machines this arm could be replaced by a drum for the reception of a driving belt. The "Tit-Bit" can be screwed on to any tub, machine trough, or ordinary table. The water is caught on a hollow bell, and drained off through a tube into any receptacle placed beneath it.

Hydro-Extractors.—Usually in all large laundries linen, when once it has been passed through the wringing machine, after rinsing or blueing, is placed in the hydro-extractor for the final removal of all easily extracted moisture before passing on to the drying or starching room. Hydro-extractors are sometimes termed centrifugals, or "whizzers." They are low, basin-like metal casings, in which is placed a loose cage, fitting on a central spindle. The spindle is put in motion by a driving belt, causing the cage to revolve very rapidly. By this means all the moisture contained in linen placed in the cage is expelled, the liquid falling through the cage and being drained off by a waste pipe.

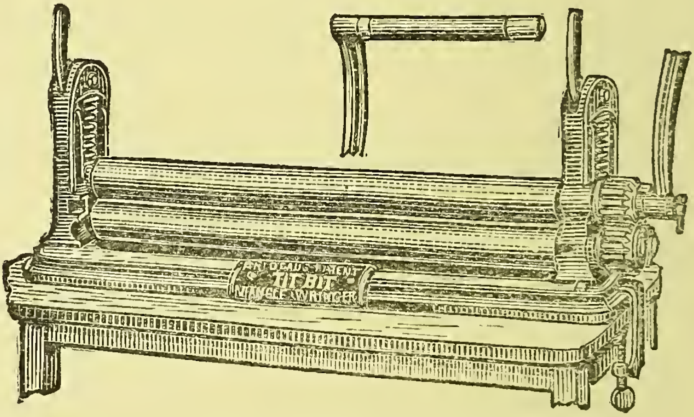


Fig. 15.—Tit-Bit Wringer.

The outer casings of the hydro-extractors are either bolted down to the flooring (when substantial foundations are required) or suspended on three rods fixed to the casing and passing down the centres of three cast-iron pillars (Fig. 16).

The cages are made of strong copper or brass wire, copper rods, or perforated metal plates. Many laundrymen have wicker-work baskets which they fit in the cages.

The cages may be revolved in many ways; hydro-extractors being constructed for top, bottom, and vertical driving. In the case of top driving, the outer case is spanned by two powerful standards and a girder, the central spindle rising up to the girder and fitting in cog-wheels, driven by a belt. The vertical driving arrangements consist of a series of cog-wheels and an upright spindle; the central spindle is driven by a cog-wheel at the base. The bottom driving arrangement is the most simple, and safest in every way. The driving belt is let through an opening in the base of the outer casing (often under the flooring), and acts immediately on a drum fixed to the base of the central spindle. The gearing in each case is put in or out of gearing by a lever on the outside.

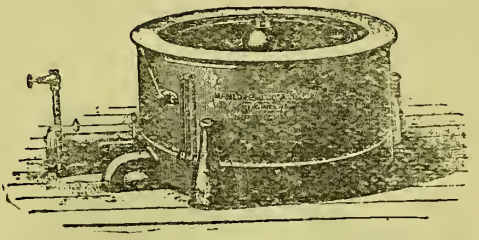


FIG. 16.—HYDRO-EXTRACTOR.

There are few machines which vary more constantly and widely in detail of manufacture and driving arrangements than the hydro-extractors.

Among the great improvements on the simple idea we may mention the suspension of the machines on three rods and a central pillar, and driving each hydro-extractor by a separate engine, placed underneath the hydro. The driving engine in these cases is placed in a chamber hidden underneath, and is worked by gas or steam conveyed to it from the main boiler.

Alliott and Haughton's Patent.—A recent patent of Alliott and Haughton has greatly facilitated the management of self-contained under-driven hydro-extractors. Formerly, in order to examine the engine, the hydro-extractor had to be displaced bodily, a task of some difficulty and demanding time, even if suspended. This patent provides, by a simple modification of the suspending arrangements, for the lifting up of the machine to a convenient height, allowing the engine to be come at with ease, and any necessary alteration made. After this the hydro-extractor is at once lowered and locked in its place, when it may be set in motion without further delay. The machine is known as the Pendulum Hydro-extractor (Fig. 17).

Hydro-extractors are generally driven by steam power, as a great velocity of the cage is necessary for efficient work. But there are small light machines made for hand labour, the motion being secured by means of a wheel, or arm provided with a handle, and acting upon a series of cog-wheels (Fig. 18).

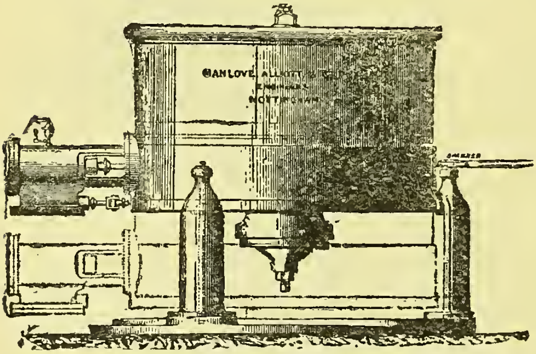


Fig. 17.—Pendulum Hydro-extractor (Alliott and Haughton's patent).

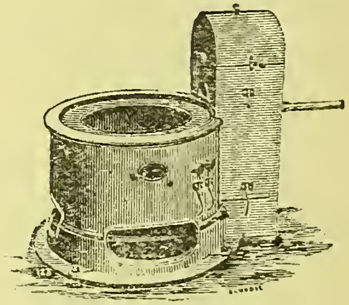


Fig. 18.—Hand-power Hydro-extractor.

We would finally remark that the more simple the driving gearing in connection with a hydro-extractor the better. Where possible, it is wise to avoid top-driven hydro-extractors, as with these machines one is always liable to soil the linen under operation, either by falling dust or grease from the gearing or belt. The working parts are oiled from the outside, and the grease should not be able to come in contact with the clothes or the cage. The use of wicker-work baskets for putting in the cage is to insure cleanliness for the linen. It was found in practice that many hydro-extractor cages, if not very carefully seen to at repeated intervals, damaged the appearance of clothes in various ways. But with wicker baskets this possibility is done away with, as then the linen does not rest actutually on the metal cage, so can neither be stained, marked, nor worn out. They are also of great advantage when the hydro-extractors are occasionally employed in "dry" cleaning processes.

When vertical driving is objected to, ordinary bottom-driven hydro-extractors have the power transmitted from the shafting by a *counter-gear.* This consists of a fast and loose pulley, with fork-belt guard, fixed to a low standard near the ground, and having a cog-wheel attached to the spindle; this vertical cog-wheel fits into another horizontal cog-wheel working a horizontal pulley. A belt transmits the power from the shafting to the vertical pulley, and a second belt transmits the power on to the machine. The use of counter-gearings has the effect of increasing the speed of the belting.

The linen on removal from the hydro-extractor is ready to be dried or starched.

Blueing and Starching Machines.—Blueing may be done in an open tub or in most washing machines, but, for the same reasons already advanced, it is more economical to have separate machines. These may simply consist of tanks, in which the blue-water is placed for the reception of the linen. Some of these tank machines are double, one tank being placed behind the other, and each one provided with a set of rollers (Fig. 19). The linen may be hand-rinsed in the first one, passed between the rollers and allowed to fall into the second tank, which may contain blueing liquor; when sufficiently

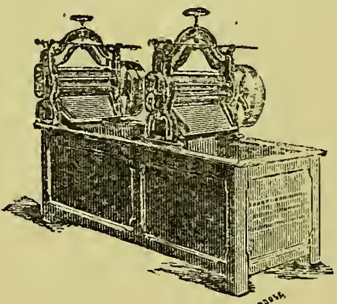


FIG. 19.—BLUEING OR STARCHING MACHINE.

blued, the linen is passed between the second set of rollers. Each set of rollers is provided with a drip-board for the guiding of the superfluous liquor back to the tank. The second set of rollers ought to have a wide board on the outside for the reception of the wrung linen.

There are also several forms of dash-wheel or dip-wheel bluers. These are barrels, or long boxes, with water-tight doors, and hung on bearings between cast-iron standards. The motion is generally rotary, sometimes eccentric.

Starching machines are virtually the same as the above; either hand troughs, dash, or dip-wheels. The rotary and eccentric machines are made to be driven by hand or power. And this choice of driving arrangements also applies to the wringing apparatus attached to blueing and starching troughs.

CHAPTER XIX.

DRYING APPARATUS.

Drying Closets—Draw-out Horse Closets—Hot-air Furnaces—Curtain-Drying Chambers—Hot and Cold air Drying—" Humidifier."

Drying Apparatus.—More or less elaborate drying arrangements are now found necessary in every well-appointed laundry. Artificial drying is the only possible plan in large cities, and it will be found most convenient even in small towns and the country. A laundry fitted with a good drying closet is independent of stress of weather; let it rain, snow, or hail, the laundry operations can go on as regularly and comfortably as in the brightest days of June or July.

It is perfectly true that clothes dried by sun in the open air keep a better colour—in fact, are virtually bleached in the most harmless way each time the drying takes place. But as the sun can only be utilised on a very limited scale with us, and, on the other hand, a drying closet is put in working order at any time within a few minutes, the artificial process must be considered the best. In fact, to the trading laundryman running an average-sized laundry the drying closet is the only way out of the difficulty.

As a general rule, and more especially where much work is done, a makeshift plan of drying clothes on wood or metal horses to be placed before a fire, or by hanging the damp linen on lines stretched across a heated room, is to be avoided. The linen will, if such a plan be followed, suffer greatly in colour, even if the room is well ventilated with exhaust fan and inlet traps. Then, accidents of all kinds are much more frequent where such primitive methods of doing business are tolerated.

In discussing the distribution of rooms in a model laundry, we have set aside one for the reception of a curtain drying chamber and an ordinary drying closet. But this latter can easily be fitted up in a corner of the wash-house, and in small laundries, whether attached to private dwellings or trading concerns, this latter plan is the one generally adopted.

Draw-out Horse Drying Closets.—Drying closets with draw-out horses may vary in size, number of horses, shape, plan of building, and mode of heating. The horses are made separately, and may be fitted up, in any number, in frames specially built to meet the requirements of the purchaser and the room at his disposal. These drying apparatus consist of a row of horses fitting into iron frames, and which, when closed, form a compact closet (Fig. 20).

Each horse is composed of two end pieces, a back and a front, held together by a number of metal rods or tubes, on which the linen is to be hung. At the bottom of each end piece, on the inside, are fixed two wheels. These wheels run on cast-iron girders, usually sunk in the flooring, extending inside the closet and to the same length outside. The back end piece is generally in metal; the front end piece may be of well-seasoned wood or metal, and is furnished with a handle, a plate-glass spy-hole, and a thermometer. If the doors or end pieces are made of wood, they are covered on the inside with galvanized iron, some non-conducting substance being introduced between the iron sheet and the wood to prevent radiation of heat. These horses fit closely in a metal frame, and run in and out on the wheels and rails. When open, the back panel forms the door, and when shut the front forms the door, thus always keeping the closet closed. When found more convenient, the rails on the ground and wheels are dispensed with, the rails being suspended from the ceiling to the frame of the closet, two curved clamps being fastened on each front panel supporting a small bevelled wheel fitting on the rail.

The roofing is capable of many modifications; it may be made of fireproof iron or glass, or the iron roofing may be covered over with wood (asbestos packing being inserted between the two), so that the top may be utilised as a slow-drying place. In this last case a rail is run round the roof, and steps affixed to the side for getting up.

Now as to the interior. The back, sides, roof, and bottom are covered with galvanized - iron sheeting. The bottom

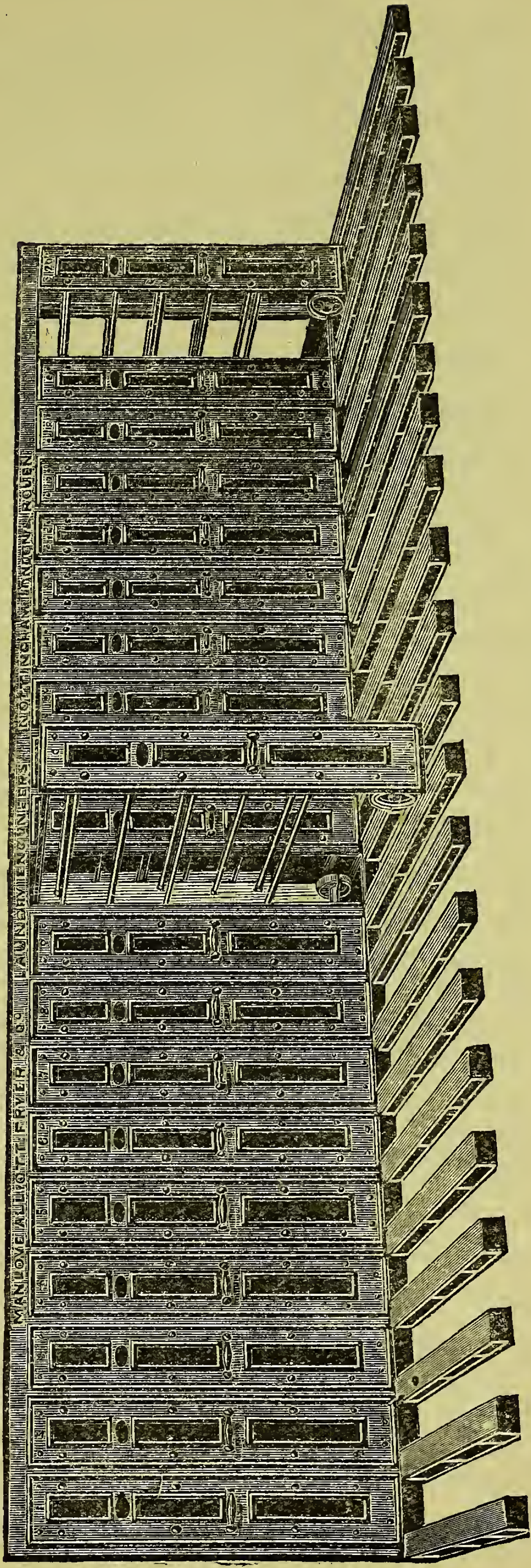

MANLOVE ALLIOTT FRYER & CO LAUNDRY ENGINEERS NOTTINGHAM LONDON ROUEN

Fig. 20.—Draw-out Horse Drying Closets.

is lower than the flooring and the rails. Perforated iron grids are placed between the rails. In the space thus left are fitted steam or hot-air coils. The grids prevent the possibility of any article falling off the horses on to the heated pipes. There are various small fittings, such as ventilating grids, valves for draining off condensed steam, and cocks for regulating the supply of steam and hot air. Much depends upon the efficiency of these valves and grids, for a badly ventilated closet, where vapour and water are allowed to accumulate, will never give satisfactory results.

The heating arrangements will greatly depend upon circumstances. In large laundries usually the heated air and gases from the engine furnace and different stoves are conducted by pipes into the base of the drying closet before being allowed to enter the tall chimney shaft. This will be sufficient for drying many goods, but additional heat ought to be provided for. This is usually done by arranging steam pipes in the base and all round the drying closet. By means of a cock placed outside, the steam can either be entirely cut off or regulated, the attendant being guided by the thermometer and the kind of articles being dried.

Most closets are provided with a door on one side, or when it occupies the whole end of a room, then it replaces one or more of the horses. This door is to enable any one to get into the interior when the closet is cool to attend to repairs, etc.

Some portable drying closets are made entirely of iron, and provided with doors; the horses are separate, and run in and out on rails, only the doors must first be opened before the horses can be got at. There is practically no foundation to this class of closet, the heating air or steam piping being arranged round the sides of the closet.

It will be seen that drying closets may be made of any number of horses; some, indeed, only contain three, two, or one horse. It is cheaper, however, to have few but long horses. When space permits, 12-feet horses are better than those of 6 feet.

Most laundry engineers will supply horses, frames, panels, grids and heating coils separately, giving general directions, so that the closets may be set up on the spot according to circumstances.

Hot-Air Furnaces.—In places where the supply of steam is limited, or otherwise fully utilised, drying closets may be heated by separate furnaces. But the greatest care will be necessary in fitting up such furnaces to prevent all possibility of burning the linen, and giving facilities for the due and speedy regulation of the heat inlet. Such furnaces may be either built beneath the closet, or on one side; the heat being distributed by means of cast-iron flues fitted round or at the base of the closet.

E. Taylor's patent hot-air stove was designed for separate heating where steam is not available. It is a small chamber of cast-iron. There is a good-sized furnace, with an ash-pit beneath the grid, furnished with a powerful draw funnel. The heated air is conducted in strong flues all over the base or sides of the closet before being permitted to escape. By drawing up a sliding panel on the side the top of the stove is exposed, and is generally made use of for heating flat-irons, or as a hot-air disinfecting chamber. By placing a vessel full of water on the top stove-plate, starch may be cooked in a *bain-marie*.

Curtain Drying Chamber.—Curtains, muslin dresses, and other fine fabrics require quick drying, and are all the better for being carefully stretched during the process. In order to make this possible, such goods are not dried in the ordinary closets but in a separate chamber. This chamber is generally made of corrugated galvanized iron sheeting.

The outside base of the walls is turned down and riveted to the concrete flooring. The roof may be of galvanized iron, or strong glass. A door with a glass window and thermometer is provided. From iron girders in the roof are suspended a number of self-adjusting frames. The frames are made of wood, their edges being fitted with a number of pins on which to stretch the curtain. Each part of the frame runs in grooves, so that the size of the frame may be adjusted simply by pressing inward or upwards. The frames are lowered and elevated by means of cords and pulleys, thus enabling the curtain or dress to be fixed in with ease, and the size of the frame regulated, when it is hoisted to the roof. The whole frame is suspended on rails by little rollers, so that the frames may be gently pushed to the right or left of the room. Ventilating grids are placed near the room, and an open grid or valve let in near the floor for carrying off condensed water. The heating apparatus is usually composed of a set of pipes for hot-air or steam. The heating may be in connection with, or quite independent from, that of the drying closet.

There are modifications of these curtain-drying contrivances. Very often they are fitted in iron frames, made to run in and out of closets, either vertically, like the horses already described, or horizontally, like drawers or shelves. Such frames may be self-adjusting or not. This form of drying closet for delicate tissues is very useful, and does not take up much room.

Hot and Cold-Air Drying.—Besides the ordinary way of heating closets by means of hot-air flues or steam coils, clothes may be dried by the direct action of a stream of hot or cold air forced through the closet or chamber. Some closets are fitted with ventilating grids or air-injectors at the base, and a powerful exhaust fan or blower-ejector near the roof; the current of air thus set up may be considerable, and when desired may be warmed at the inlet. Blackman fans and common inlet grids, or Aland's fan and blower-injector are very often employed for this purpose with most encouraging results. These methods of drying are suitable to all kinds of fabrics, and are specially useful where there is only a limited supply of steam, and where the erection of a stove would be unsafe or inconvenient. For private laundries, schools, etc., the plan is much appreciated.

The Humidifier.—Among the many contrivances for drying by cool or hot air is Lacy's patent humidifier and air-distributor, which is worked in combination with a heating and cooling chest (Howorth's patent).

The apparatus consists of two chambers or chests, connected by a flue, in the middle of which flue is placed a powerful ventilating fan. The upper chest is fitted with steam or water coils, and is filled with air drawn in through a conduit by means of the draught created by the fan. The upper chamber is also nearly divided horizontally by two metal plates, so as to deflect the current of air on to the steam or water coils. The lower chest (the humidifier proper) is also supplied with a double steam or water coil, and is divided horizontally by a perforated plate. The air drawn down through the upper chamber by the fan is forced into the lower portion of the second chamber, and filters through the perforated plate, on which a film of water can be maintained, coming in contact with the two coils, and is allowed to escape into the drying closet or room through an open-mouthed coil. The film of water is only used when damp air is needed, and is supplied through a pipe, provided with a stop-cock, the lower end of the plate having a tube for the escape of the surplus water through a valve. The pipes mentioned as passing through the first and second chambers may be filled with cold water or with steam. Thus in connection with the humidifier plate and the coils, hot or cold, damp or dry air may be forced into any chamber at high pressure. For our present purpose only the dry hot or cold air would be required. But for certain phases of textile cleaning processes the warm moist air would be most useful.

CHAPTER XX.

BOX AND ROLLER MANGLES.

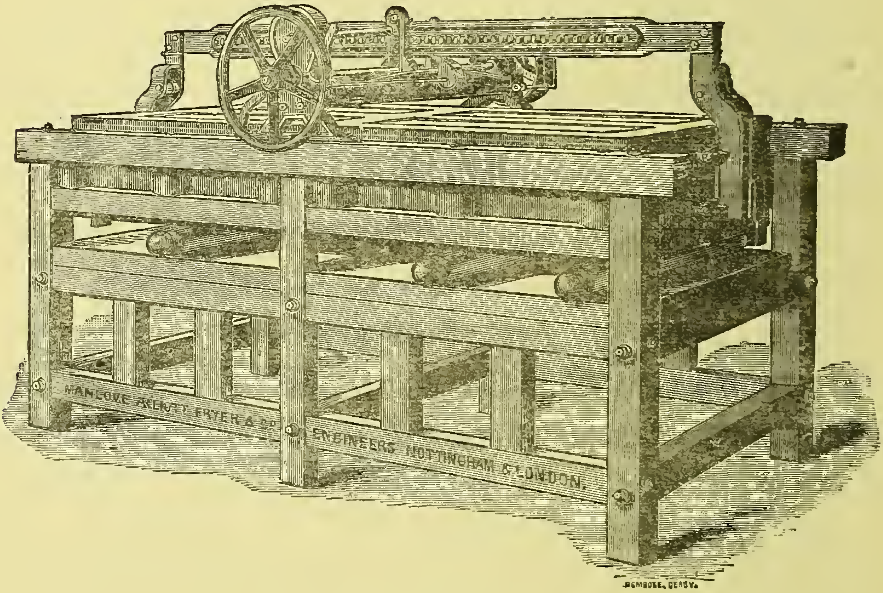
Box Mangles, Roller Mangles, Steam Roller Mangles, and their Management—American Machines.

Box Mangles.—The old pattern box mangle is still widely used, and found to give good results when used for household and body linen.

The box mangle (Fig. 21) consists of a strong frame of well seasoned wood, bolted together with iron bolts and screw-heads, and measuring about six feet long by two and a half in breadth, and three in height. Midway down the frame are several transverse beams of wood supporting the mangling-bed. This mangling-bed may be made either of hard mahogany or teak, or of some special stone. The wood beds are found to warp and dent after much wear, even with the best mahogany, when they have to be replaned and "trued." Stone beds do not require any such readjustment, and consequently the first extra expense of the stone bed must be looked upon as a real economy. The work done is about equally good on either kind of bed; that is, if the mahogany is in a proper state of repair.

On the bed are placed two or four hard-wood rollers, with projecting heads at both ends, which heads coming in contact with the vertical portion of the mangle-frame prevent the rollers coming off the bed.

On the rollers is placed a weighted box, fitting exactly in the mangle-frame, only being somewhat shorter. At each end of this box a cast-iron support is screwed on. A cast-iron standard is riveted to each side of the mangle-frame, just half-way between each end. These standards support the driving arrangement, usually consisting of a cross-bar and a large cog-wheel, the motive-power being conveyed to the cog-wheel by means of levers attached to the pulley or driving-wheel and handle for manual labour. The actual movement of the box, causing the rollers to do the mangling work by rolling under pressure and smoothing out the linen placed between them and the stone bed, is usually imparted by a chain. This chain is fastened to the cast-iron supports at both ends of the box, and passes through a stopping and starting lever over the central cog-wheel, which on being made to revolve drags the box backwards and forwards. The driving gearing is now almost always fitted with automatic reversing movements.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BEMROSE, DERBY.

FIG. 21.--BOX MANGLE.

A great improvement on this chain movement is the automatic reversing rack and pinion gearing (Fig. 21). In this arrangement the chain is dispensed with, and a cast-iron girder, fitted with metal notches, substituted. The large central wheel is also dispensed with, a small toothed wheel taking its place, and by fitting into the notches on the girder, when made to revolve it drags the box first to one end, and on being automatically reversed sends it back to the other end. This driving gearing can also be worked either by hand or steam power.

When mangling with box mangles, great care must be taken to place the articles of linen truly square under the first roller, and they must be guided through as long as possible. If articles have to be folded, they must be first stretched, and then folded seam to seam, in order to prevent them going awry, or coming out with unnecessary pleats.

Roller Mangles.—The roller mangles are far easier to manage and less cumbersome than box mangles. They consist of two or three rollers, hung in bearings, and revolving over a polished wood or metal bed, the whole being supported by cast-iron standards. As a rule the top roller is pressed down by one or more springs.

There are also simple mangles with two rollers and no bed. They are supported by iron standards and regulated by a spring and screw. The rollers may be of metal or wood. In the first case they are often hollow and heated by gas or steam. These machines closely resemble the ordinary clothes-wringers.

Steam Roller Mangles.—Taking the ordinary type of steam heated and driven roller mangle, we find it consists of strong cast-iron standards, supporting a convex polished metal or wood bed (Fig. 22). At either end of the bed is a simple extension roller, fitted into borings in the frame. These extension rollers are intended to stretch and move an endless flannel web, which should be of the exact width of the bed, and carefully sewn on so as to be quite tight, and with the seam as little prominent as possible. Resting on the bed are two polished metal rollers, fitting in brass or gun-metal bearings. The top roller is pressed down at will by means of a spring and a screw, which are supported in their places by an over-arching bar. The driving arrangements consist of two cog-wheels and fast and loose pulleys, with forked guard and starting and stopping gear, placed on one side. On the other side are usually the pipes and cocks for the supply of steam, each roller being fitted with a valve for the removal of the condensed water. A simple lever arrangement can be provided for reversing the motion of the rollers, by which means an article may be passed twice through the mangle, and be returned to the front or feeding side of the machine. When this reversing motion is not made use of a receiving board may be screwed on to the

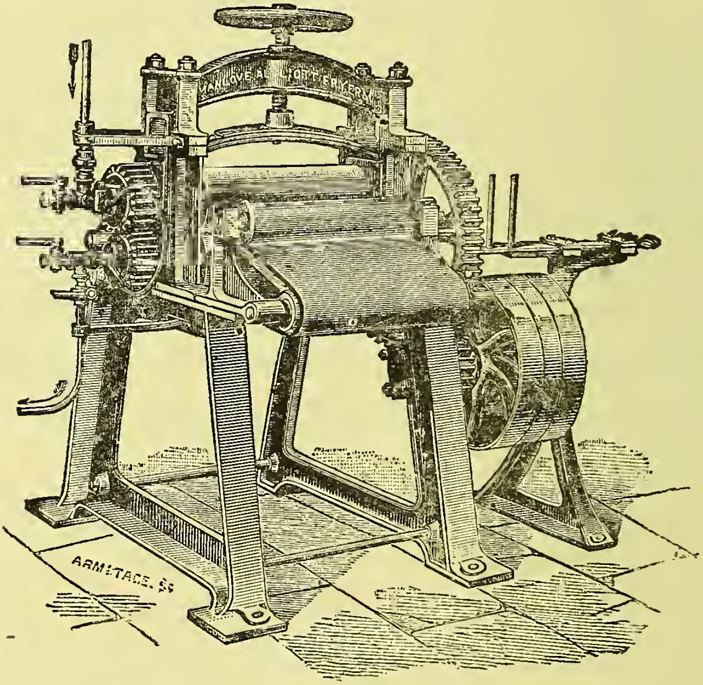

FIG. 22.—STEAM ROLLER MANGLE.

opposite side, or a table placed ready for the reception of the goods as they come out from beneath the top roller.

The operation of mangling is easily performed with roller machines. The articles are placed smoothly on the flannel web when the machine is in motion, and are then carried up under the rollers without further trouble or guidance of any kind.

When preferred, the rollers (and bed, too, if desired) can be heated by gas instead of steam. In such cases, each roller should have an air-tube and a gas-pipe. The gas must be lit through the air-tube. Steam, however, is found to give far more equal and, therefore, reliable results.

Some of the American roller mangles are very elaborate machines, but prove satisfactory. They have a good type of double-roller gas- or steam-heated mangle. The big lower roller is covered with flannel; the small upper one is for polishing. The pressure is put on the upper roller by means of levers connected with adjusting weights beneath the machine. The starting and stopping gear is a foot lever. These machines are fitted with a feeding and receiving board.

Another elaborate American mangle has an extensive convex metal bed, and three polishing rollers, fitting in strong bearings; both ends of each roller are provided with a pressure spring and screw with hand-wheel. Steam supply pipes and condensation valves as well as starting, stopping, and reversing gearing, are also provided. It is a useful machine, but, on the whole, demands rather too much care for adjusting the pressure and general regulating.

Laundrymen now are certainly in possession of several good and serviceable mangling machines, but inventors and manufacturers might easily find room for further improvements. We stand in need of a light but substantial machine to fit in between the common wooden roller mangle and the elaborate ironing machines—a mangle that could be easily managed, not take up too much room, and yet give good results both in smoothing and polishing linen. In this matter the Americans come nearer the mark than we do. The doing away with the top over-arching bar, with the spring, screw, and hand-wheel, must be regarded as a decided advantage. By this arrangement, the top of the machine is left completely free, and the pressure is put with equal force on the ends of each roller, either by means of a separate spring and hand-regulating screw, or by separate springs regulated by a lever under the machine, and to be pressed down by the foot. One or other of the above simple arrangements is generally found in connection with the American types, and have also been adopted in Belgium and France. If found necessary, the top rollers may be easily protected with wire guards stretched on properly shaped light metal frames, the ends of which are made to rest on the frames of the roller bearings. But in reality, such protection is rarely necessary.

American machines are generally "pattern" made, the various parts being interchangeable. Some of their smaller mangles are admirable and much appreciated for exportation; on the other hand, these cheap, light and labour-saving American machines are not very durable. It is a pity that some of our laundry engineering firms do not step in and fill the void there is for a cheap, light, but effective and reliable roller mangle.

We will remind our readers that roller mangles not automatically adjustable ought to be relieved of all pressure when not in use. This will make the bearings last longer, and keep the rollers in good condition.

Roller mangles, gas- or steam-heated, are often called calenders, and will be found under this heading in American and other manufacturers' price lists.

CHAPTER XXI.

IRONING MACHINES.

The Decoudun Ironer—The "Great Western" Decoudun—Machine with Convex Bed and Rollers—Collar, Cuff, and Shirt Ironers—Flat Machine Ironers—Roller Ironers—General Remarks.

IRONING machines may be broadly divided into two classes: those with a polished bed and large rollers, intended for ironing table and plain linen only; and small roller or flat-iron machines for finishing heavily starched goods.

The Decoudun Ironer.—The large roller ironer was the invention of one Decoudun, a Frenchman, but the design has been so well appreciated that it has been adopted extensively all over the Continent, in England, and in America. The original design has been altered and improved upon so often that the various machines now manufactured by engineering firms hardly resemble, in any one particular, the first patent.

The decoudun varies in size and construction with each maker. A simple form consists of a polished metal bed (concave) and a heavy roller, fitted in a strong cast-iron frame. The roller is pressed down in its bearings on the metal bed by means of a steel spring over-arching the roller, held in its place by a tie-bar, and regulated by a screw with hand-wheel fitting into the tie-bar. The driving gearing, fast and loose pulleys, stopping and starting levers, etc., are on one side, while a board underneath the machine is connected by means of levers with a *clip* board, which is placed on hinges, and presses against the roller when working. The roller may be lifted and lowered by means of a lever.

The actual work is done in this manner. The heavy roller is covered with flannel, and when revolving drags the articles to be ironed through, polishing them on the concave metal bed which is heated; the roller is also better heated.

In the larger sized decouduns, heated by steam, there is usually a tie-bar supporting the driving shafting and stopping and starting levers, but no central spring (Fig. 23). There is a long treadle board under the machine connected with levers for lifting and lowering the flannel-covered roller. The roller and bed, being heated by steam, are provided with steam-cocks and valves for removing the condensed water, and also a safety-valve. Some of the machines are fitted with reversing gear.

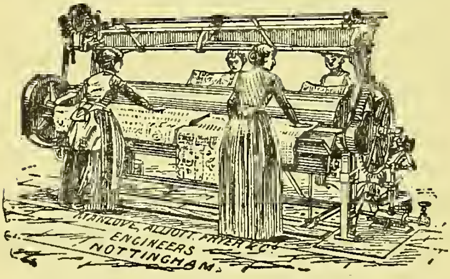

FIG. 23.—DECOUDUN IRONER.

The "Great Western" Decoudun.—A great improvement in this general type of the decoudun is the Great Western (Fig. 24). One of the most striking differences is the absence of the tie-bar over the roller; this leaves the top quite free and also guards against the possibility of anything falling upon the linen from the over-arching shafting. The leverages are under the machine. One belt suffices to drive the machine and lift the roller. Both the roller and bed are steam heated; the ends lead into steam traps, which are self-acting, and do away with any trouble about regulating waste-cocks. The feeding and delivery tables are of polished oak; and all the fittings are in gun-metal. The stopping, starting, and lifting operations are all done from the feeding side.

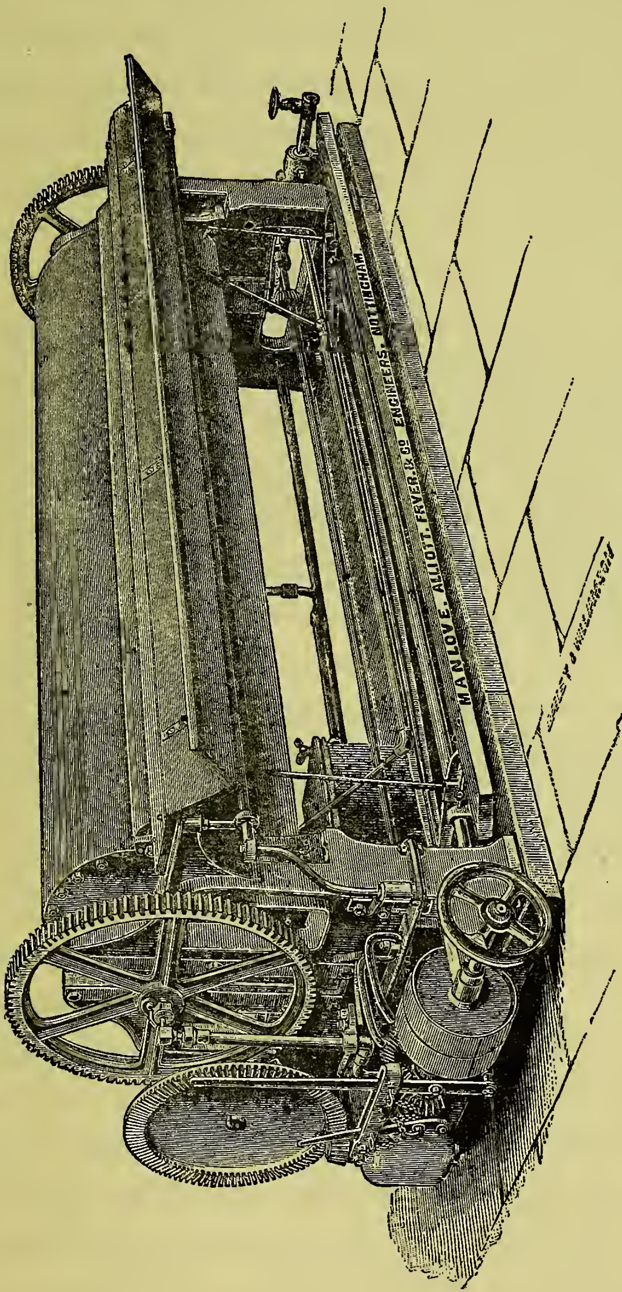
MANLOVE. ALLIOTT. FRYER. & Co ENGINEERS. NOTTINGHAM.

FIG. 24.—GREAT WESTERN DECOUDUN IRONER.

Machine with Convex Bed and Rollers.—Messrs. Hall, Limited, of Dartford, have patented a large ironing machine whereby the actual mode of working is reversed. Instead of the linen being carried round by the flannel-covered roll and polished on the concave bed, the linen is polished by the rollers. A polished metal convex bed is fitted in a strong cast-iron frame on standards. Over this bed is stretched an endless blanket, which is worked round by revolving extension rollers at each end of the bed. Over the bed, resting in unwearable bearings, are a series of polished steam-heated rollers. These are made to revolve. The goods to be ironed are placed on the flannel web, the machine is started, and the articles are carried under the polishing rollers and are returned to the feeding side on the top of the rollers. Thus the goods are thoroughly ironed and aired. Provision is made for the wearing away of the blanket, the rollers adjusting themselves automatically in accordance with the increasing thinness of the flannel, doing away with the necessity of readjusting the pressure of the rollers. The convex bed and rollers are heated by steam; supply pipes and waste valves being duly provided.

A smaller machine of the same type, but with a few minor alterations, is manufactured as a collar and cuff ironing machine. It is also worked and heated by steam.

Collar, Cuff, and Shirt Ironers.—The smaller machines used for ironing collars, cuffs, shirts, and other highly starched articles demanding a fine polish are even more numerous than the decoudun and other big ironers.

Flat Machine Ironers.—Among these are one or two machines with a movable iron bed and a fixed flat-iron. Manlove's patent (Fig. 25) is composed of a strong standard frame, with driving gear and two projecting arms, closed at the end, and with a guiding spindle in the middle, on which the top part of a large hollow flat-iron slides backwards and forwards. Under this flat-iron is placed a metal plate, covered with flannel blanket; it is held firmly in its place by cast iron supports, and is capable of being lifted or lowered by means of a treadle. The machine is driven and their iron heated by steam.

The operation of ironing is easy. An article is stretched on the blanket and linen-covered plate. The driving gearing is then put in motion, and the plate pressed against the flat-iron by depressing the treadle. The action of the iron is, like that of a hand one, backwards and forwards. The article being ironed has to be guided, but the pressure is at once increased or lessened at the will of the operator.

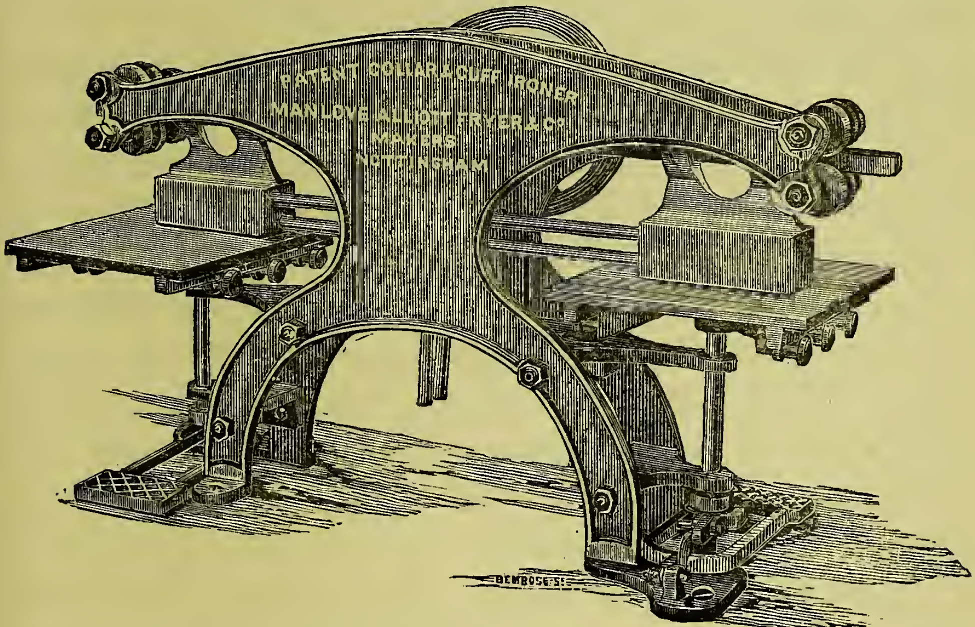

FIG. 25.—COLLAR AND CUFF IRONER.

A machine with two irons and two plates is also manufactured. These ironers act excellently as hot-pressers in dry cleaning processes.

Roller Ironers.—Taylor & Heywood's patent roller shirt and collar ironer is provided with a polished gun-metal steam-heated roller, and a hardwood travelling table; the whole fitted in a cast-iron frame on standards, having the driving gearing and steam pipes at one end. The travelling table guides the articles under the polishing roller.

General Remarks.—The Americans have a great variety of roller shirt and collar ironing machines. Some of them have a metal bed and a roller, others two or more rollers and no bed. In many of these machines the operator stands or sits on a raised platform, which is connected by levers with the rollers, and thus the pressure is put on and off instantly by a person stepping off or on the board.

The bed plates of American roller ironing machines are made of all kinds of shapes, to suit collar and cuff ironing, shirt bosom polishing, etc.

They also have special machines for ironing shirt collar bands, for goffering, frilling, shaping and folding collars, etc.

There is a clever little machine for using an ordinary box or a special gas-heated iron, where the pressure is done by mechanism, but the guiding by hand. The American pattern is composed of a metal plate mounted on four legs, and with an upright standard, holding over the ironing plate a jointed arm; the iron is fitted to this arm, which is pressed tightly down upon the plate by means of a spiral spring attached from the arm to the standard. The ironing plate is lifted and lowered by a lever or a treadle.

In the English patent (Bash's "Handy Ironer") the iron is heated by steam, and pressed down on the ironing plate by levers connected with a treadle. In this way ironing is rendered much easier and less fatiguing; the pressure being mechanical, the operator has only to pull, push, and guide the iron in any desired direction.

In most high-class laundries small machine ironers are used for small goods, but not for finishing collars and shirts. These are only *blocked* by these machines, and the finishing touches are done by hand irons. It is argued that by this method the collars and shirts get a much better polish than if entirely ironed by machines. Laundry engineers, however, claim for many of their machines the power of giving the highest finish and polishing. But in spite of this the old plan of finishing off collars, cuffs, shirts, frills, and, of course, lace and muslins by hand still largely obtains in our best steam laundries.

With regard to steam-heated roller ironers, we would always prefer to recommend those types possessing the least top hamper (such as tie-bars, shafting, springs, and screws). The stopping, starting, and lifting gear, and the pressure leverage, can always be placed conveniently beneath or by the side of the machine—out of the way of the working. The pressure on the rollers may be managed either by spiral springs or levers and adjustable weights.

CHAPTER XXII.

CARPET BEATING.

Carpet-beating House—Carpet-beating Machines—The Bed and Beaters —The Driving Gearing—Brushing Attachment—Motive Power.

As the managers of many steam laundries now undertake carpet-beating by machinery, a few remarks on the subject are advisable.

Carpet-Beating House.—The house or shed in which carpets are cleaned and beaten should be as completely removed from the laundry as possible. If the machine is provided with a good exhaust fan, it may be set up in a lean-to shed, but with separate door and having no window or other open connection with the laundry building. It is well to have the floor of the shed covered over with cement, and made to slant down to open conduits running round the room. This arrangement will allow of the floor to be used as a wet-cleaning bed when carpets need washing; it will also enable the floor, walls, etc., to be easily flushed out with water in order to keep the place clean. There should be a good light; and a few shelves for packing away finished goods.

Carpet-beating Machines.—Most of the machines in the market consist of large wood boxes, with a rounded top, and neatly varnished. They vary greatly in size, but the measurements of 6 feet 6 inches deep by 6 feet 6 inches high, and a length or width of from 12 to 24 feet, may be taken as the average dimensions. This large box may be rivetted down to the flooring by clamps, but as a rule this is not necessary. A door is placed in the back to enable any one to get inside the machine; here also is a hole, covered over with a box, for the reception of an exhaust fan, designed to remove the dust. In the front part of the machine, about four feet and a half from the ground there is a long narrowish slit in the box, through which the carpet is pushed in upon the beating bed. In most machines a wood roller is placed at this opening to facilitate the ingress and egress of the carpets; the roller is fixed to the end frame pieces of the machine, and revolves when touched. A flap of wood is placed above the opening on hinges, to close it up when desired. The driving gearing is fixed to the left or right side of the box.

The Bed and Beaters.—Inside the box, about an inch below the ingress slit, a strong wooden frame is firmly rivetted. It is about two feet deep and slants gently inwards. This frame contains the bed, which differs considerably with each patent. Some of the beds are composed of interlaced strips of strong leather, but it is found that this bed is not quite elastic enough. A good bed is composed of a row of leather belts, bolted to the frame by means of flat springs (Alexander Orr's patent). Yet another satisfactory bed is made with strong steel wire interlocked, and fastened to the top part of the wood frame by spiral springs (Smithers and Sons' patent). Both these beds do excellent service, as they are elastic, give very slightly under each stroke of the beaters, and in returning to their original position, jerk the carpet and cause it to leap up several inches. This facilitates the getting rid of the dust on both sides.

In the centre of the box a spindle or shaft runs the whole length fitting in bearings connected with the driving gearing.

Attached to this shaft are three flat-iron flanges, to which are fastened three successive rows of beaters.

The beaters are also different according to the patentee manufacturers. The old beaters were chains, but these are decidedly destructive. Strong leather loops studded with metal bosses are a special feature. Orr's patent machine is provided with peculiarly hardened india-rubber beaters, attached to the shaft on hinges. Smithers' beaters are manufactured with two thicknesses of heavy buffalo-hide rivetted together. These beaters are made to rotate on the central shaft and come down with considerable force and rapidity on the carpet lying on the bed. All dust is thus beaten out, and falls through the bed, or flies about the interior of the box, but is at once caught up by the draught caused by an exhaust fan placed in the back of the box, and which is driven by an endless belt. The dust is forced up a conduit (of wood, metal, or masonry), and deposited in a chamber, through which a jet of steam or water is forced to allay it.

If the fan is sufficiently powerful and has been well placed, the carpet ought to be completely free from dust as it comes out of the machine. As a rule, a carpet is put in first on the right side slowly and withdrawn slowly, getting two beatings; if it is a very thick or dirty carpet, it must be put in once more, on the wrong side.

The Driving Gearing.—The beaters may be worked either with one or two driving belts, passing over fast and loose pulleys. If a strong machine with good bearings, one belt ought to be sufficient, and this arrangement is to be preferred. A lever is sometimes provided, which, on being lifted into an upper notch, puts the machine out of gearing. In other cases, a forked belt guard enables the belt to be put on or off the loose pulley.

Brushing Attachment.—When the carpets are finally removed from the beating machine, they ought to be spread out on the floor and carefully brushed over with long-haired brooms. A clever device has been patented whereby a cylindrical brush is attached to the carpet-beater, and is driven by machinery.

Smithers' Patent Carpet-Brushing Machine is composed of square blocks of wood in which strong bass bristles are inserted in a cylindrical form. These brushes are pierced and are strung on an iron bar of the precise length of the carpet-beating machine. The ends are fitted in bearings in such a way as to cause the brush to be held just in front of the ingress slit of the box. A lever on the left side enables the brush arrangement to be lifted up above the slit when it is out of gearing and remains still. When lowered by means of the lever it is at once in gearing, and the same driving wheels that work the central beater bearing shaft cause the brush to revolve, thus brushing the carpet as it is being pulled out. As a rule the brush is made to work only when the carpet is being withdrawn, and is put out of gearing on the carpet being put in. But as the action of the brush can be reversed, the brush may be kept in constant action.

This form of brush may be fitted on any type of carpet-beating machine, and is a real improvement. The brushing process is done thoroughly, rapidly, and with little labour. It will be found specially useful where the carpet-beater is fitted up in a small house, as the carpet need not be spread out at all, but carefully folded immediately it comes out of the machine.

Carpets rarely require wet cleaning. But prominent stains may be removed with solutions of ammonia, borax, benzine, or spirits of wine (according to the nature of the stains), by following the directions given in Chapter XIV. Many kinds of druggets may be placed in the large dash-wheel rinsing machines and given a thorough washing after having undergone the beating operations. When this latter course is adopted, the drugget will have to be very carefully dried, as all moisture should be extracted without straining the texture or subjecting the drugget to great heat.

Motive Power.—The carpet-beater may be driven by the same engine as that used for the laundry machinery, but as a rule it is found more convenient to have a separate small one-horse-power engine (steam or gas) for the carpet-beater and its fan.

CHAPTER XXIII.

MISCELLANEA.

Boilers—Soap and Soda Dissolvers—Stoves—Barrows—Engine Boilers; Cross-tube type, Multitubular—"Exhaust" Injector—Steam Engines.

THERE are a number of less important utensils and machines to be found in most laundries that will require a few words of explanation.

Boilers.—The soaking pans and boilers are generally one and the same utensil. There is first the old-fashioned copper or iron boiler, built in a socket of masonry, and provided with an ashpit and grate underneath. When these are in daily use it will be necessary to see that the bottom does not get burnt through, and that the flue always draws well.

We next have iron cauldrons, placed with a flat base on a special iron stone; the whole being such as can be fitted in any corner, or the middle, of a room. They are convenient, and generally safer and more manageable than the old fixed enclosed coppers, and they are provided with a tap at the bottom, and a good lid.

Messrs. Manlove, Alliott, & Co. manufacture a nest of four steam boiling coppers (Fig. 26). The boilers are made of copper, brass, or cast iron, and are fitted with perforated false bottoms to allow the dirt to fall out of the way of the linen. The coppers may be heated by steam, each copper having a separate waste valve and a set of supply pipes; all four being encased in a wooden box with a gun-metal top. In the middle of the four coppers is placed a central stand pipe, with steam, hot and cold water main pipes, and cocks over each copper. These coppers may also be fitted in a row, to place them against a wall; the supply pipe running at the back (Fig. 27). They may be used as soaking tanks, hand-washing troughs, and coppers for boiling linen.

There is a very simple form of hand-washing trough much in favour. It consists of a shallow metal pan, mounted on iron standards. There is a waste pipe at the bottom, with a cock; two or three overflow holes a few inches from the top, and two service pipes and cocks, one for hot and the other for cold water. These hand-washing troughs are generally erected in pairs, but in large establishments as many as eighteen or twenty-four are used. They should be placed against a wall, and the main service hot and cold water pipes made to run the whole length, above or beneath.

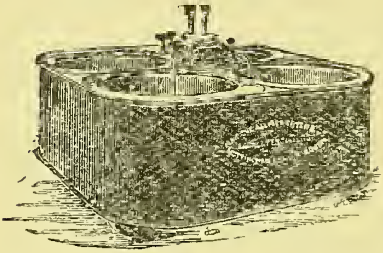

FIG. 26.—STEAM BOILING COPPERS.
Nest of four.

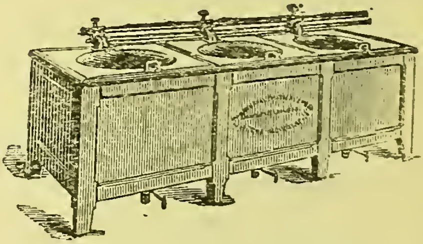

FIG. 27.—STEAM BOILING COPPERS.
Fitted in row.

Soap and Soda Dissolvers.—When dealing with the washing of linen, both in the first and second parts of this book, we have spoken of washing fluids and alkaline lyes. In practice it is found advisable not to place soap or soda directly into washing troughs, coppers, or machines. These detergent agents should first be thoroughly dissolved in cold or warm water, and only then put in the coppers and machines.

In order to do this without loss of time or materials, special machines are provided (Fig. 28). They generally consist of metal tanks, encased in wood and mounted on cast iron standards. They are provided with a tight-fitting cover, an outlet valve at the bottom, and cold and hot water pipes. As a rule they are mounted in pairs, in one case, and on the same set of standards. These machines, provided with a jacket for the reception of hot water or steam, are to be preferred, as they enable the washing solutions to be boiled. They may also be used for preparing blueing water and for cooking starch. Some dissolvers are provided with steam-heating coil instead of the jacket.

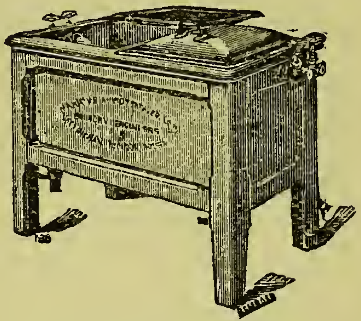

FIG. 28.—SOAP AND SODA DISSOLVERS.

Stoves.—We have already spoken about the stoves employed for warming flat-irons, so we have not much to add here, except that those stoves made in the fewest pieces are to be preferred. There are some excellent stoves cast in only two pieces, the furnace doors having no hinges, but fitting in special grooves or flanges. There is less chance of these cracking or otherwise getting out of order.

Barrows.—Barrows on wheels are necessary for use in the sorting and disinfecting rooms and the washhouse. Every engineering firm has a special make of barrows. There is a very useful water-tight barrow, used for transporting wet clothes and as soaking troughs; but they are rather heavy. A really good trough ought to be provided with a false bottom and a waste pipe with cock; and the lighter they run on their wheels the better.

Engine Boilers.—Practically the vast number of boilers now in the market are reduced to two types for the laundryman. As a rule, the engineering skill in laundry establishments is not remarkable, and therefore a simple and safe boiler is what must be looked for. We would advocate the use of vertical boilers of the *cross-tube* type (they are usually cheap, very simple in construction, and fairly safe, even if badly treated). A more economical boiler for heavy work may be selected from among simple *multitubular boilers*. But these boilers will give trouble when hard water is used, as they lend themselves to the depositing of lime, and this, when it does not cause explosions or splitting, causes undue consumption of fuel and loss of heat.

The consumption of fuel only partly depends upon the type of boiler. Careless firing is the general cause of heavy consumption of coal. The fire-bars should always be in good repair, and as soon as one gets worn out it should be replaced, or much good coal will fall through into the ash-pit. The ash-pit should be kept as free as possible, for if choked up with ashes the necessary current of air for the due consumption of the fuel will fail, causing loss of heat and fuel. The feeding of the furnace should be regular, not spasmodic or excessive.

Great care should always be observed not to let the water in the boiler fall too low. An ingenious safety valve has been recently patented, which gives warning (automatically) by whistling when the water falls below a safe level.

The feed-water had better be warmed in all cases, but it is essential when hard water is used. This warming may be performed by waste steam, either collected in a trap or utilised by means of an injector.

The "Exhaust" Injector.—Davies, Metcalf, and Hamer's patent "Exhaust" Injector is an ingenious little machine, working automatically and forcing heated water into the boiler, only using the heat of waste steam. The use of hot feed-water not only lessens the deposit of lime but prevents the straining of the plates, so common when boilers are fed with cold water, as the difference of temperature of the boiling water and the freshly admitted cold water counteracts the natural expansion of the boiler plates, and causes them to contract with dangerous suddenness.

Steam-engines.—It is impossible to lay down any hard and fast rules as to the selection of a steam-engine for laundry work, as so much depends upon the amount of power required and the particular situation of the engine-house. In some cases a horizontal engine will be preferred, whilst in others a vertical one would best answer the purpose.

In choosing an engine it will be well to keep in mind that the simpler it is the less care and attention will it require. But efficiency and safety must not be sacrificed to simplicity. An efficient steam gauge and safety-valve are essential.

Laundrymen should take the trouble of supervising their engineers, who are very often careless, and cause considerable loss. The engine should always be kept clean and well lubricated; it should work perfectly smoothly and noiselessly. When an engine is noisy in working it is a proof that it has been neglected and is dirty; this causes friction and loss of power. To remedy this more fuel is consumed, and only too often the safety-valve tampered with. There is no excuse whatever for loading or otherwise interfering with a safety-valve, and anyone who does so ought to be instantly dismissed.

Gas-engines.—Many laundrymen have entirely discarded the steam-engine, getting all the motive power they may require from gas-engines. There are several useful types of gas-engines in the market; the "Cycle" being one of the best for laundry purposes. The advantages of the gas-engine are its inexpensiveness (both as regards prime cost and working), its easy management, and the great promptness with which motive power is procured. Formerly only small engines were available, but now several of the gas-engines—and in this particular the "Cycle" takes a prominent place—are of such dimensions as to give, economically, all the power required in a laundry.

When gas-engines are used, it is usual to have a low pressure boiler for the generation of steam for heating and cleansing purposes. Such boilers are cheap, easily managed, and do not require a great consumption of fuel. Steam will, of course, be necessary for the washing-machines; and it is always best for heating machine ironers, roller mangles, and drying rooms; but for these latter purposes sufficient heat may be safely obtained with gas—most of the ironers and mangles may be fitted with steam or gas-heating arrangements at the option of the purchaser.

There seems to be a great field for the employment of gas-engines, and they will be found specially useful and economical in small laundries, where the work is more or less intermittent. These engines are easily kept in proper working order.

General Remarks.—We would advise laundrymen to provide themselves with good text-books on the use of steam. *A Treatise on Steam-boilers*, by R. Wilson, C.E.; *A Text-book on the Steam-engine, with a Supplement on Gas-engines*, by T. W. Goodeve, M.A.; *Stationary Engine Driving*, by Michael Reynolds; together with *The Safe Use of Steam*, by "An Engineer," would form a valuable little library for every laundry office.

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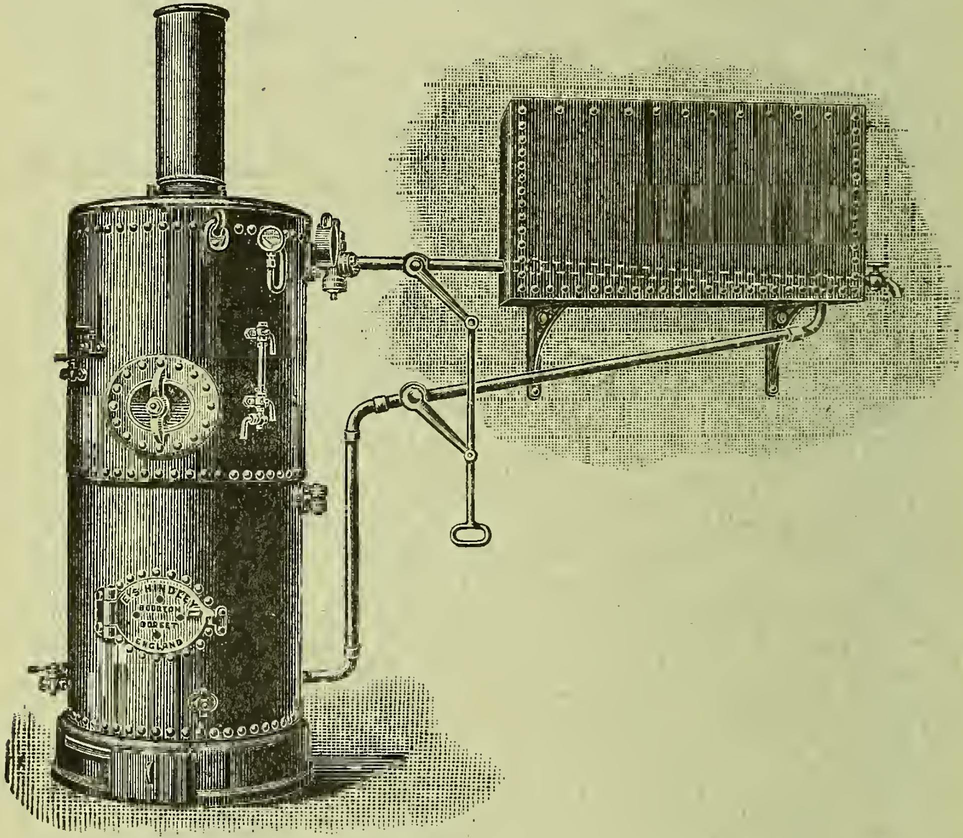

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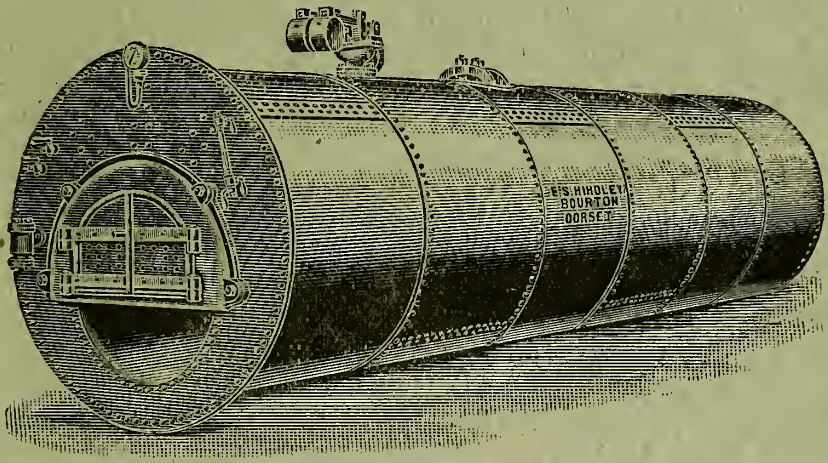

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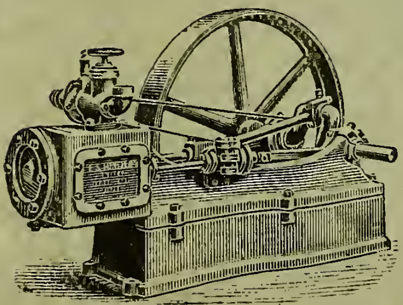

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